

# EXHIBIT C

**UNITED STATES DISTRICT COURT FOR  
THE DISTRICT OF KANSAS**

IN RE URETHANE ANTITRUST LITIGATION	) )	MDL 04-1616 (JWL/JPO)
THIS DOCUMENT RELATES TO: POLYETHER POLYOL CASES	) )	Civil Action Nos. 08-2617, 09-2026, 10-2077

**REVISED EXPERT REPORT OF MATTHEW E. RAIFF, PH.D.**

**April 15, 2011  
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Expert Report of Matthew E. Raiff, Ph.D.

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## **1. Executive summary**

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## 1.1. Introduction

(1) I have been engaged by Counsel for the 11 direct action plaintiffs (“Plaintiffs”) in this litigation to determine the extent to which the Plaintiffs were overcharged as a result of a conspiracy among suppliers of TDI, MDI, and polyether polyols. I was instructed to assume that a conspiracy took place from 1994 through 2003 (the “conspiracy period”). I was asked to calculate overcharges over (1) the conspiracy period and (2) the period from January 1999 through December 2003 (the “class period”). I found that Plaintiffs’ overcharges for the conspiracy period totaled approximately \$596.5 million, which represents 12.1% of their purchases, and Plaintiffs’ overcharges for the class period totaled approximately \$370.8 million, which represents 12.2% of their purchases. In this executive summary, I highlight aspects of my analysis and summarize my opinions.

## 1.2. Industry background

(2) The products at issue in this litigation include two types of isocyanates—toluene di-isocyanate (TDI) and methylene diphenyl di-isocyanate (MDI)—and various forms of polyether polyols. TDI, MDI and polyether polyols are basic chemical building blocks of a wide variety of very common polyurethane products. These products include the following:

- Flexible foams used in bedding, carpeting, furniture, auto cushions, etc.;
- Rigid foams used primarily as insulating material in construction and refrigeration applications;
- Coatings, adhesives, sealants, and elastomers (CASE) used in applications in the construction, transportation, electronics, appliances, machinery, textiles, and furniture industries;
- Thermoplastic polymers (TPU) used for injection molding and extrusion in products for industrial and automotive applications;
- Polyurethane binders used in the manufacture of engineered wood products, as a binding agent for tracks and flooring, and in foundries.

(3) TDI, MDI, and polyether polyols are derived from petroleum, natural gas, and other chemicals through chemical reactions. They are sold separately or in combinations known as “systems.” The Plaintiffs purchased only small amounts of systems. During the conspiracy period, US sales of TDI, MDI, and polyether polyols totaled approximately \$20 billion.

- (4) Throughout the conspiracy period, Defendants collectively owned a high share of US industry capacity. In the United States, over the period 1992–2008 they controlled
  - Approximately 75% of TDI capacity through 1996, and 100% thereafter;
  - 100% of MDI capacity; and
  - Approximately 80% of polyether polyol capacity.
- (5) High barriers to entry existed as a result of the large capital requirements to construct new plants, the time required for construction, the technological requirements, and the need for access to chemical precursors.
- (6) The Plaintiffs manufactured a wide variety of products used in transportation, construction, automotive, textile, furniture, carpeting, bedding, appliance, machinery, and other industries. Collectively, they purchased approximately \$4.9 billion of TDI, MDI, and polyether polyols from Defendants during the conspiracy period, which represented 24% of Defendants' total sales of these products during that period.

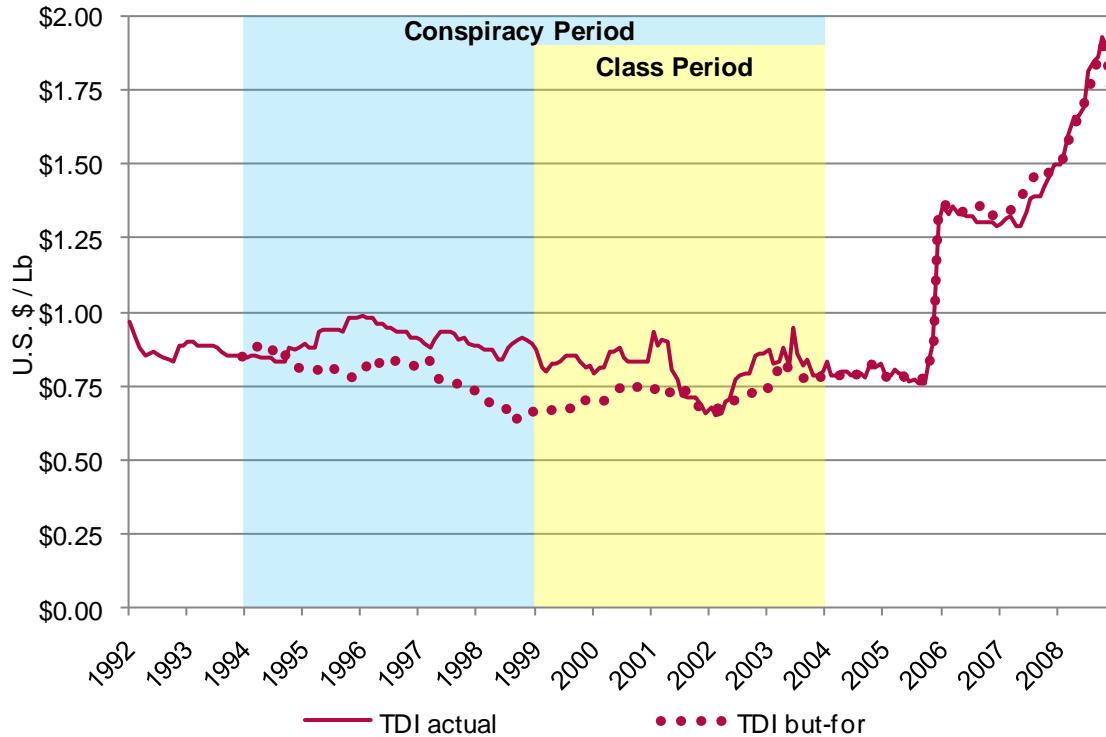
### **1.3. Summary of overcharge analysis**

- (7) My assignment was to determine the extent to which, as a result of the conspiracy, Plaintiffs were overcharged for their purchases of TDI, MDI, and polyether polyols. Overcharges consist of the differences between the prices Plaintiffs actually paid during the conspiracy and the prices they would have paid if the conspiracy had not occurred. I developed and implemented econometric models designed to calculate, for every affected transaction during the conspiracy period, a price that would have prevailed absent the conspiracy.
- (8) My analysis proceeded in several steps. First, based upon economic theory, my experience, my training, and my study of the industry, I identified and collected data on important supply and demand variables related to TDI, MDI, and polyether polyol prices. Second, I used generally accepted econometric methods—in particular, a reduced-form multiple regression analysis—to analyze the relationship between these supply and demand variables and prices during a benchmark period untainted by Defendants' conspiracy. Third, I used the benchmark econometric modeling results, along with the observed values of the supply and demand variables during the conspiracy period, to estimate the prices of TDI, MDI, and polyether polyols that would have prevailed but for the conspiracy, i.e., the “but-for” prices.

(9) The econometric model accounted for changes in supply and demand conditions by using variables likely to influence supply and demand for TDI, MDI, and polyether polyols. On the supply side, these variables included the prices of primary chemical inputs toluene, benzene, propylene, chlorine, ethylene, methanol and ammonia; the price of natural gas (which is an input factor and a source of energy); and wages. On the demand side, these variables included the US carpeting and furniture industrial production; the US appliances, carpeting and furniture industrial production; US motor vehicle assemblies; and US housing starts. I included variables on exchange and interest rates as these variables influenced both supply and demand. I also included variables to account for important events in 2005: Hurricanes Katrina and Rita, the permanent closure by Defendants of 34% of US TDI capacity, and the permanent exit from the TDI industry of two of the five TDI suppliers.

(10) Throughout the conspiracy period, various Defendants offered justifications for price increases that included factors such as costs, demand factors, profit margins, and capacity utilization. My model appropriately took these factors into account.

(11) For the conspiracy period (1994–2003), I had sufficient data to estimate my model on a benchmark period comprised of the two years before the conspiracy period (i.e., 1992 and 1993) and the five years following the conspiracy period (i.e., 2004–2008). As an example, Figure 1 depicts the actual and estimated but-for prices for a major product, TDI 80/20. It shows that, after controlling for nonconspiratorial factors, prices were elevated from October 1994 through June 2001 and from April 2002 through September 2003.

**Figure 1 Actual and but-for TDI prices**

Source: Combined transaction database and Bates White analysis

(12) As noted above, I also was asked to estimate overcharges over the class period (1999–2003). Based upon a careful review of the evidence available to me, I determined that it would not be appropriate to include 1994 to 1998 in the benchmark period, because the evidence and information available to me indicated that a conspiracy affected US prices during that time period. It is well known that if a model is estimated on data from a benchmark period during which prices were affected by a conspiracy, the model will underestimate damages. Accordingly, to estimate overcharges for the class period, I used the same model that I employed for the conspiracy period.

## 1.4. Calculation of overcharges

(13) I estimated an overcharge for every transaction involving every product at issue. Summaries of the Plaintiffs' overcharges during the conspiracy period are presented in Figure 2 and Figure 3. For the conspiracy period, Plaintiffs' overcharges totaled approximately \$596.5 million, which represents 12.1% of their purchases. Figure 4 and Figure 5 summarize the

Plaintiffs' overcharges during the class period. For the class period, Plaintiffs' overcharges totaled approximately \$370.8 million, which represents 12.2% of their purchases.

**Figure 2 Plaintiffs' total purchases, overcharge percentages, and overcharges by Defendant during the conspiracy period (January 1994–December 2003)**

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
British Vita	BASF	\$121,703,936	9.0%	\$10,995,330
	Bayer	\$271,702,496	12.9%	\$35,032,725
	Dow	\$68,354,098	19.2%	\$13,152,644
	Huntsman			
	Lyondell	\$64,959,362	14.5%	\$9,387,585
British Vita Total		<b>\$526,719,892</b>	<b>13.0%</b>	<b>\$68,568,284</b>
Carpenter	BASF	\$257,029,980	12.2%	\$31,257,016
	Bayer	\$225,698,375	12.2%	\$27,631,310
	Dow	\$21,843,473	18.1%	\$3,954,090
	Huntsman	\$9,539,055	11.6%	\$1,108,145
	Lyondell	\$601,776,388	11.1%	\$66,784,067
Carpenter Total		<b>\$1,115,887,271</b>	<b>11.7%</b>	<b>\$130,734,629</b>
Flexible Foam	BASF	\$30,876,537	14.3%	\$4,405,193
	Bayer	\$252,980,397	10.4%	\$26,403,696
	Dow	\$6,286,713	10.4%	\$654,359
	Huntsman	\$173,132,045	11.5%	\$19,893,685
	Lyondell	\$261,255,272	13.3%	\$34,816,522
Flexible Foam Total		<b>\$724,530,964</b>	<b>11.9%</b>	<b>\$86,173,455</b>
Foam Supplies	BASF	\$7,355,355	22.0%	\$1,619,100
	Bayer	\$12,126,799	12.8%	\$1,549,153
	Dow	\$44,606,526	14.3%	\$6,373,750
	Huntsman	\$6,032,563	11.1%	\$671,066
	Lyondell	\$1,441,296	11.8%	\$170,258
Foam Supplies Total		<b>\$71,562,539</b>	<b>14.5%</b>	<b>\$10,383,326</b>
Hickory Springs	BASF	\$399,819,155	11.8%	\$47,263,868
	Bayer	\$202,726,570	8.9%	\$18,131,608
	Dow	\$89,610,306	11.9%	\$10,647,652
	Huntsman	\$7,121,391	13.0%	\$927,236
	Lyondell	\$25,104,155	16.7%	\$4,192,053
Hickory Springs Total		<b>\$724,381,577</b>	<b>11.2%</b>	<b>\$81,162,417</b>
Huber	BASF	\$480,292	18.7%	\$89,781
	Bayer	\$116,145,309	11.5%	\$13,399,525
	Dow			
	Huntsman	\$125,920,787	15.8%	\$19,845,919
	Lyondell			
Huber Total		<b>\$242,546,388</b>	<b>13.7%</b>	<b>\$33,335,225</b>

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
Leggett & Platt	BASF	\$137,898,512	12.1%	\$16,745,353
	Bayer	\$3,939,736	7.8%	\$308,299
	Dow	\$383,235,735	12.7%	\$48,652,068
	Huntsman	\$44,407,979	15.5%	\$6,869,082
	Lyondell	\$5,301,128	8.6%	\$457,255
Leggett & Platt Total		<b>\$574,783,090</b>	<b>12.7%</b>	<b>\$73,032,057</b>
Lubrizol	BASF	\$182,162	3.0%	\$5,537
	Bayer	\$29,139,200	5.8%	\$1,703,790
	Dow			
	Huntsman	\$60,492,149	7.2%	\$4,341,111
	Lyondell			
Lubrizol Total		<b>\$89,813,511</b>	<b>6.7%</b>	<b>\$6,050,438</b>
MarChem	BASF	\$3,548,443	8.4%	\$299,193
	Bayer	\$55,895,091	10.5%	\$5,860,806
	Dow	\$38,714,829	12.2%	\$4,740,732
	Huntsman	\$50,347	9.9%	\$4,998
	Lyondell	\$33,208,927	9.5%	\$3,153,133
MarChem Total		<b>\$131,417,636</b>	<b>10.7%</b>	<b>\$14,058,863</b>
Skypark	BASF	\$46,977	18.3%	\$8,606
	Bayer	\$9,096,939	16.9%	\$1,533,712
	Dow	\$33,700,699	15.7%	\$5,288,104
	Huntsman	\$16,378,808	14.8%	\$2,418,541
	Lyondell	\$11,080,436	14.1%	\$1,567,083
Skypark Total		<b>\$70,303,858</b>	<b>15.4%</b>	<b>\$10,816,046</b>
Woodbridge	BASF	\$208,614,225	12.7%	\$26,511,190
	Bayer	\$488,325,690	5.9%	\$28,691,373
	Dow	\$119,994,885	9.1%	\$10,861,178
	Huntsman	\$17,000,280	10.7%	\$1,816,031
	Lyondell	\$325,400,053	10.5%	\$34,291,339
Woodbridge Total		<b>\$1,159,335,133</b>	<b>8.8%</b>	<b>\$102,472,609</b>
Total	BASF	\$1,167,555,574	11.9%	\$139,200,167
	Bayer	\$1,667,776,602	9.6%	\$160,547,497
	Dow	\$806,347,263	12.9%	\$104,324,578
	Huntsman	\$460,075,404	12.6%	\$57,895,813
	Lyondell	\$1,329,527,018	11.6%	\$154,819,294
Grand Total		<b>\$5,431,281,860</b>	<b>11.4%</b>	<b>\$616,787,349</b>

**Figure 3 Plaintiffs' total purchases, overcharge percentages, and overcharges by product family during the conspiracy period (January 1994–December 2003)**

Plaintiff	Product family	Purchases	Overcharge percentage	Overcharges
British Vita	TDI	\$230,989,008	12.4%	\$28,587,162
	MDI	\$3,962,905	16.2%	\$641,462
	Polyols	\$291,767,979	13.5%	\$39,339,660
British Vita Total		<b>\$526,719,892</b>	<b>13.0%</b>	<b>\$68,568,284</b>
Carpenter	TDI	\$746,743,044	13.8%	\$102,909,975
	MDI	\$102,527,178	15.5%	\$15,883,695
	Polyols	\$266,617,050	4.5%	\$11,940,958
Carpenter Total		<b>\$1,115,887,271</b>	<b>11.7%</b>	<b>\$130,734,629</b>
Flexible Foam	TDI	\$309,772,877	12.2%	\$37,839,899
	MDI	\$21,952,452	9.5%	\$2,081,972
	Polyols	\$392,805,635	11.8%	\$46,251,584
Flexible Foam Total		<b>\$724,530,964</b>	<b>11.9%</b>	<b>\$86,173,455</b>
Foam Supplies	TDI			
	MDI	\$62,077,374	14.8%	\$9,182,294
	Polyols	\$9,485,166	12.7%	\$1,201,031
Foam Supplies Total		<b>\$71,562,539</b>	<b>14.5%</b>	<b>\$10,383,326</b>
Hickory Springs	TDI	\$326,121,734	9.7%	\$31,779,886
	MDI	\$7,882,307	16.5%	\$1,301,922
	Polyols	\$390,377,537	12.3%	\$48,080,609
Hickory Springs Total		<b>\$724,381,577</b>	<b>11.2%</b>	<b>\$81,162,417</b>
Huber	TDI			
	MDI	\$241,416,373	13.8%	\$33,269,403
	Polyols	\$1,130,015	5.8%	\$65,822
Huber Total		<b>\$242,546,388</b>	<b>13.7%</b>	<b>\$33,335,225</b>
Leggett & Platt	TDI	\$218,338,680	12.4%	\$27,142,205
	MDI	\$55,252,985	11.1%	\$6,135,835
	Polyols	\$301,191,425	13.2%	\$39,754,016
Leggett & Platt Total		<b>\$574,783,090</b>	<b>12.7%</b>	<b>\$73,032,057</b>
Lubrizol	TDI			
	MDI	\$89,813,511	6.7%	\$6,050,438
	Polyols			
Lubrizol Total		<b>\$89,813,511</b>	<b>6.7%</b>	<b>\$6,050,438</b>
MarChem	TDI	\$802,995	7.3%	\$58,657
	MDI	\$75,804,618	12.5%	\$9,459,815
	Polyols	\$54,810,023	8.3%	\$4,540,390
MarChem Total		<b>\$131,417,636</b>	<b>10.7%</b>	<b>\$14,058,863</b>
Skypark	TDI	\$3,630	-0.5%	-\$17
	MDI	\$39,754,338	16.9%	\$6,721,285
	Polyols	\$30,545,890	13.4%	\$4,094,779
Skypark Total		<b>\$70,303,858</b>	<b>15.4%</b>	<b>\$10,816,046</b>
Woodbridge	TDI	\$383,735,332	11.5%	\$44,251,218
	MDI	\$20,664,270	14.4%	\$2,976,771
	Polyols	\$754,935,531	7.3%	\$55,244,619
Woodbridge Total		<b>\$1,159,335,133</b>	<b>8.8%</b>	<b>\$102,472,609</b>
Total	TDI	\$2,216,507,298	12.3%	\$272,568,986
	MDI	\$721,108,311	13.0%	\$93,704,894
	Polyols	\$2,493,666,252	10.0%	\$250,513,469
Grand Total		<b>\$5,431,281,860</b>	<b>11.4%</b>	<b>\$616,787,349</b>

**Figure 4 Plaintiffs' total purchases, overcharge percentages, and overcharges by Defendant during the class period (January 1999–December 2003)**

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
British Vita	BASF	\$80,878,036	9.8%	\$7,933,689
	Bayer	\$161,834,543	13.1%	\$21,146,111
	Dow	\$42,260,872	20.8%	\$8,801,071
	Huntsman			
	Lyondell	\$21,458,650	25.8%	\$5,532,523
British Vita Total		<b>\$306,432,100</b>	<b>14.2%</b>	<b>\$43,413,394</b>
Carpenter	BASF	\$88,480,783	11.6%	\$10,221,513
	Bayer	\$178,245,201	10.9%	\$19,384,923
	Dow	\$16,305,518	19.9%	\$3,247,610
	Huntsman	\$4,599,280	14.9%	\$684,365
	Lyondell	\$252,304,732	13.5%	\$33,979,239
Carpenter Total		<b>\$539,935,514</b>	<b>12.5%</b>	<b>\$67,517,650</b>
Flexible Foam	BASF	\$21,351,503	13.5%	\$2,880,466
	Bayer	\$180,567,286	9.1%	\$16,500,828
	Dow	\$6,254,975	10.4%	\$651,652
	Huntsman	\$96,306,226	10.2%	\$9,843,620
	Lyondell	\$52,434,899	36.2%	\$18,972,999
Flexible Foam Total		<b>\$356,914,888</b>	<b>13.7%</b>	<b>\$48,849,564</b>
Foam Supplies	BASF	\$6,367,391	22.0%	\$1,400,252
	Bayer	\$1,430,097	27.9%	\$398,426
	Dow	\$24,796,758	16.9%	\$4,178,816
	Huntsman	\$5,363,424	10.4%	\$555,498
	Lyondell	\$367,461	29.0%	\$106,632
Foam Supplies Total		<b>\$38,325,131</b>	<b>17.3%</b>	<b>\$6,639,624</b>
Hickory Springs	BASF	\$228,310,860	12.7%	\$29,013,492
	Bayer	\$129,600,267	8.3%	\$10,772,573
	Dow	\$20,791,398	22.6%	\$4,701,827
	Huntsman	\$3,658,852	18.4%	\$674,959
	Lyondell	\$9,572,902	33.3%	\$3,184,196
Hickory Springs Total		<b>\$391,934,279</b>	<b>12.3%</b>	<b>\$48,347,046</b>
Huber	BASF	\$480,292	18.7%	\$89,781
	Bayer	\$116,128,488	11.5%	\$13,398,094
	Dow			
	Huntsman	\$93,124,082	17.3%	\$16,077,860
	Lyondell			
Huber Total		<b>\$209,732,862</b>	<b>14.1%</b>	<b>\$29,565,735</b>
Leggett & Platt	BASF	\$74,882,011	13.2%	\$9,909,155
	Bayer	\$1,181,072	7.0%	\$83,018
	Dow	\$222,814,186	14.0%	\$31,284,589
	Huntsman	\$22,998,678	15.7%	\$3,614,559
	Lyondell	\$674,137	24.9%	\$168,184
Leggett & Platt Total		<b>\$322,550,085</b>	<b>14.0%</b>	<b>\$45,059,506</b>

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
Lubrizol	BASF	\$71,125	7.9%	\$5,620
	Bayer	\$16,187,627	6.6%	\$1,065,425
	Dow			
	Huntsman	\$29,625,595	7.9%	\$2,326,635
	Lyondell			
Lubrizol Total		<b>\$45,884,348</b>	<b>7.4%</b>	<b>\$3,397,680</b>
MarChem	BASF	\$3,430,746	8.6%	\$294,789
	Bayer	\$44,512,875	10.4%	\$4,610,392
	Dow	\$17,262,464	15.6%	\$2,698,395
	Huntsman			
	Lyondell	\$5,163,583	28.1%	\$1,450,549
MarChem Total		<b>\$70,369,668</b>	<b>12.9%</b>	<b>\$9,054,125</b>
Skypark	BASF	\$46,977	18.3%	\$8,606
	Bayer	\$8,158,695	18.4%	\$1,503,954
	Dow	\$12,489,452	26.0%	\$3,249,496
	Huntsman	\$7,790,800	20.1%	\$1,569,694
	Lyondell	\$3,670,164	27.5%	\$1,008,318
Skypark Total		<b>\$32,156,087</b>	<b>22.8%</b>	<b>\$7,340,069</b>
Woodbridge	BASF	\$104,451,069	11.1%	\$11,562,339
	Bayer	\$437,646,291	5.2%	\$22,738,930
	Dow	\$68,395,534	12.0%	\$8,205,631
	Huntsman	\$9,136,742	9.0%	\$821,708
	Lyondell	\$99,464,030	18.7%	\$18,635,846
Woodbridge Total		<b>\$719,093,665</b>	<b>8.6%</b>	<b>\$61,964,455</b>
Total	BASF	\$608,750,793	12.0%	\$73,319,701
	Bayer	\$1,275,492,442	8.7%	\$111,602,675
	Dow	\$431,371,156	15.5%	\$67,019,087
	Huntsman	\$272,603,681	13.3%	\$36,168,899
	Lyondell	\$445,110,556	18.7%	\$83,038,487
Grand Total		<b>\$3,033,328,627</b>	<b>12.2%</b>	<b>\$371,148,848</b>

**Figure 5 Plaintiffs' total purchases, overcharge percentages, and overcharges by product family during the class period (January 1999–December 2003)**

Plaintiff	Product family	Purchases	Overcharge percentage	Overcharges
British Vita	TDI	\$131,539,976	10.9%	\$14,326,276
	MDI	\$2,383,646	19.1%	\$455,053
	Polyols	\$172,508,478	16.6%	\$28,632,065
British Vita Total		<b>\$306,432,100</b>	<b>14.2%</b>	<b>\$43,413,394</b>
Carpenter	TDI	\$469,763,860	11.6%	\$54,579,719
	MDI	\$59,428,028	18.6%	\$11,042,254
	Polyols	\$10,743,626	17.6%	\$1,895,677
Carpenter Total		<b>\$539,935,514</b>	<b>12.5%</b>	<b>\$67,517,650</b>
Flexible Foam	TDI	\$153,234,135	10.8%	\$16,565,168
	MDI	\$21,432,397	9.5%	\$2,031,881
	Polyols	\$182,248,356	16.6%	\$30,252,515
Flexible Foam Total		<b>\$356,914,888</b>	<b>13.7%</b>	<b>\$48,849,564</b>
Foam Supplies	TDI			
	MDI	\$33,578,387	17.5%	\$5,862,546
	Polyols	\$4,746,744	16.4%	\$777,078
Foam Supplies Total		<b>\$38,325,131</b>	<b>17.3%</b>	<b>\$6,639,624</b>
Hickory Springs	TDI	\$173,868,980	8.6%	\$14,907,476
	MDI	\$6,807,874	17.0%	\$1,159,419
	Polyols	\$211,257,425	15.3%	\$32,280,152
Hickory Springs Total		<b>\$391,934,279</b>	<b>12.3%</b>	<b>\$48,347,046</b>
Huber	TDI			
	MDI	\$208,604,783	14.1%	\$29,499,913
	Polyols	\$1,128,079	5.8%	\$65,823
Huber Total		<b>\$209,732,862</b>	<b>14.1%</b>	<b>\$29,565,735</b>
Leggett & Platt	TDI	\$122,527,363	10.9%	\$13,308,025
	MDI	\$30,938,146	13.7%	\$4,238,517
	Polyols	\$169,084,575	16.3%	\$27,512,963
Leggett & Platt Total		<b>\$322,550,085</b>	<b>14.0%</b>	<b>\$45,059,506</b>
Lubrizol	TDI			
	MDI	\$45,884,348	7.4%	\$3,397,680
	Polyols			
Lubrizol Total		<b>\$45,884,348</b>	<b>7.4%</b>	<b>\$3,397,680</b>
MarChem	TDI	\$309,344	8.9%	\$27,480
	MDI	\$45,167,697	14.0%	\$6,308,889
	Polyols	\$24,892,627	10.9%	\$2,717,755
MarChem Total		<b>\$70,369,668</b>	<b>12.9%</b>	<b>\$9,054,125</b>
Skypark	TDI	\$0		\$0
	MDI	\$19,593,675	23.4%	\$4,588,320
	Polyols	\$12,562,412	21.9%	\$2,751,749
Skypark Total		<b>\$32,156,087</b>	<b>22.8%</b>	<b>\$7,340,069</b>
Woodbridge	TDI	\$226,580,957	9.8%	\$22,129,389
	MDI	\$18,463,183	14.6%	\$2,702,727
	Polyols	\$474,049,525	7.8%	\$37,132,339
Woodbridge Total		<b>\$719,093,665</b>	<b>8.6%</b>	<b>\$61,964,455</b>
Total	TDI	\$1,277,824,614	10.6%	\$135,843,533
	MDI	\$492,282,165	14.5%	\$71,287,199
	Polyols	\$1,263,221,849	13.0%	\$164,018,116
Grand Total		<b>\$3,033,328,627</b>	<b>12.2%</b>	<b>\$371,148,848</b>

Expert Report of Matthew E. Raiff, Ph.D.

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## **2. Qualifications**

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(15) My name is Matthew E. Raiff. I am a Partner and founding Member of Bates White, LLC (“Bates White”), a professional services firm that conducts economic and statistical analysis in a variety of industries and forums. I specialize in performing economic and statistical analysis of competition and pricing for antitrust and other litigation and regulatory matters. Before joining Bates White, I was an Associate with the management-consulting firm of A.T. Kearney, a postdoctoral Economist with The Pennsylvania State University, and an Instructor with the Department of Economics at Duke University.

(16) I received my PhD in Economics from Duke University in 1997 and my BA in Economics from Canisus College in 1991. My doctoral fields of concentration included industrial organization, microeconomic theory, and public finance. While at Duke University, I taught courses in microeconomics, macroeconomics, and experimental economics. In my doctoral dissertation, I analyzed certain differences between competitive and collusive behavior.

(17) I have published economic articles in peer-reviewed journals and chapters in books. My 2008 article in the *International Journal of Industrial Organization* won the 2009 Paul Geroski Award for being one of two best papers published in the journal in that year.

(18) I have been retained as an expert witness or consultant on matters of competition policy in a variety of industries, including computers, chemicals, industrial products, pulp and paper products, transportation, jewelry, and agricultural nutrition. I submitted an expert declaration on behalf of a large international plaintiff group in *In re Graphite Electrode Antitrust Litigation*. I also served as the lead consulting expert performing economic analyses to assess liability and damages in a variety of cases involving allegations of collusion in the last decade. I was the lead consulting expert for defendants in *In re Ethylene Propylene Diene Monomer (EPDM) Antitrust Litigation*, *In re Polychloroprene (PCP) Antitrust Litigation*, and *In re Polyester Staple Fiber Antitrust Litigation* and for plaintiffs in *In re Dynamic Random Access Memory (DRAM) Antitrust Litigation*, *In re Rubber Chemical Antitrust Litigation*, and *In re Linerboard Antitrust Litigation*.

(19) A copy of my *curriculum vitae* is attached in Appendix A. Bates White is being compensated for my time in this matter at my standard hourly rate of \$650 per hour.

Expert Report of Matthew E. Raiff, Ph.D.

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### **3. Scope of charge**

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(20) I was retained by Counsel for Plaintiffs in the actions styled *Carpenter Co., et al v. BASF SE, et al.*, Civil Action No. 08-2617 (D. Kan.), *Woodbridge Foam Corporation, et al. v. BASF SE, et al.*, Civil Action No. 09-2026 (D. Kan.), and *Dash Multi-Corp, Inc., et al. v. BASF SE, et al.*, Civil Action No. 10-2077 (D. Kan.). Plaintiffs are represented by the law firms of Adams Holcomb LLP and Dickstein Shapiro LLP.<sup>1</sup> My charge was to determine the extent to which Plaintiffs were overcharged as a result of a conspiracy to elevate prices of certain key chemicals—specifically, TDI, MDI, and polyether polyols—used in the manufacture of polyurethane products.

(21) Counsel provided me with specific instructions and assumptions concerning these calculations; these are contained in Appendix B and summarized below.

(22) Counsel instructed me to assume that a conspiracy was in effect with regard to TDI, MDI, and polyether polyols (“polyether polyol products”) from January 1994 through December 2003 (the “conspiracy period”).

(23) Counsel instructed me to assume the corporate participants in the conspiracy include:

- Defendants BASF SE (f/k/a BASF AG), BASF Corporation, and BASF Coordination Center Comm. V. (collectively, BASF);
- Defendant The Dow Chemical Company (Dow) and its predecessor-in-interest EniChem (whose polyurethanes business was acquired by Dow in 2001);
- Defendant Huntsman International LLC (f/k/a Huntsman ICI Chemicals LLC) (Huntsman) and its predecessor-in-interest Imperial Chemicals Industries Ltd. (ICI);
- Defendant Lyondell Chemical Company (f/k/a Lyondell Petrochemical Company) and its predecessors-in-interest ARCO Chemical Company and Rhone-Poulenc;
- Bayer AG, Bayer Corporation, Bayer MaterialScience AG, and Bayer MaterialScience LLC (collectively, Bayer).

(24) Counsel instructed me to calculate overcharges on purchases made by Plaintiffs and their predecessors-in-interest in the United States. Set forth in Appendix C are the specific instructions I was given regarding the purchases for which Plaintiffs are asserting claims.

<sup>1</sup> Associated with Adams Holcomb and Dickstein Shapiro in this litigation are the law firms Barnes & Thornburg LLP, Schmeideskamp, Robertson, Neu & Mitchell LLP, Edmisten & Webb Law Firm, Nexsen Pruet LLC, and Stueve Siegel Hanson LLP.

(25) Counsel instructed me that the overcharge on any particular transaction should be calculated as the amount purchased times the difference between the price actually paid and the estimated price that would have been paid but for the conspiracy.

(26) Counsel instructed me that the products at issue are

- “TDI products,” which include various forms of toluene di-isocyanate (TDI);
- “MDI products,” which include various forms of diphenylmethane di-isocyanate (MDI), including monomeric (“pure”) and polymeric forms;
- blends of MDI and TDI;
- polyether polyol products, which include various propylene-oxide based polyether polyols.<sup>2</sup>

(27) Following the convention of papers filed in this litigation, I refer to these products collectively as “polyether polyol products.”

(28) Counsel instructed me to calculate overcharges over:

- the conspiracy period, January 1994 to December 2003;
- the class period, January 1999 to December 2003.

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<sup>2</sup> It is my understanding that these products fall within the Court-approved class definition.

Expert Report of Matthew E. Raiff, Ph.D.

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#### **4. Materials relied upon**

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- (29) In preparing this report, I was provided with access to documents and materials produced by the plaintiffs and defendants and transcripts of depositions taken in this matter. I also had many publicly available information sources available to me.
- (30) I instructed my support team to identify all information pertaining to the pricing of the products at issue in this litigation, as well as those factors that influenced the pricing of these products. My support team requested all pertinent documents and materials provided by the plaintiffs and defendants in this litigation, and my team conducted searches of publicly available information sources. The information was detailed, came from a variety of different sources, and covered a long period of time. At my direction, my team identified the most pertinent documents and collected them for my review.
- (31) My team also reviewed Plaintiff-supplied and Defendant-supplied transaction data sets. I found that the Plaintiff-supplied data contained little information that was not found in the Defendant-supplied data. At my direction, my team created a combined transaction database from the Defendant-supplied data. This combined transaction database contained Defendant-provided purchase records for the direct action plaintiffs, class plaintiffs, and other entities. In the course of combining the data, I directed my team to standardize the data fields most relevant to my analysis. Appendix E contains a detailed description of this process.
- (32) Appendix D lists the materials on which I relied. Generally, I consider myself to have relied upon (in addition to my training and experience) the materials and analyses identified in this report. I considered a wider array of materials. The data and information that I considered prior to reaching my opinions were voluminous.

Expert Report of Matthew E. Raiff, Ph.D.

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## **5. Industry background**

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(34) In this section, I summarize my review of the industry. I conducted this review to identify important economic factors that would have affected pricing during 1992–2008. First, I discuss the products at issue in this case. Second, I review the demand for these products. Third, I provide an overview of the production processes used to manufacture the products. Fourth, I review the suppliers in the industry. Fifth, I describe the Plaintiff purchasers. Sixth, I review changes in the industry during the period of my analysis. Seventh, I describe evidence the Defendants' conspiracy operated during 1994–1998. Eighth, I study the relationship between prices in the United States, Europe, and elsewhere.

## 5.1. Products

### 5.1.1. Products at issue

(35) Polyether polyol products are basic building blocks of a wide array of polyurethane products. The principal categories of polyurethane end products include

- flexible (soft) foams used in bedding, carpeting, furniture, auto cushions, etc., which comprise the largest use for polyurethanes;
- rigid foams used primarily as an insulating material in construction and refrigeration applications;
- coatings, adhesives, sealants, and elastomers (CASE) that have a wide range of applications in construction, transportation, electronics, appliances, machinery, textiles and furniture industries;
- thermoplastic polymers (TPU) used for injection molding and extrusion, primarily for products going into industrial and automotive applications;
- polyurethane binders used in the manufacture of engineered wood products such as oriented strand board (OSB), as a binding agent for tracks and flooring, and in foundries.

(36) Foam applications, the predominant end use, involve the combination of an isocyanate (i.e., TDI or MDI) with a polyol. Nonfoam applications often involve both an isocyanate and a polyol (e.g., MDI and polyols are used together in the manufacture of coatings, adhesives, sealants, and elastomers) but might involve only an isocyanate (e.g., MDI is used without a polyol as a binder in the manufacture of OSB) or only a polyol (e.g., polyols are used in certain lubricant applications).

### 5.1.2. Products for which I have not been asked to calculate overcharges

- (37) Counsel did not ask me to calculate overcharges on Plaintiffs' purchases of certain categories of related products—namely, polyester polyols,<sup>3</sup> pure ethylene oxide-based polyols, PTMEG polyols, and prepolymers.<sup>4</sup>
- (38) Generally, unless otherwise noted, throughout this report I will use the term "polyols" to mean polyether polyols, which are the subject of this litigation.
- (39) I also was not asked to calculate overcharges on Plaintiffs' purchases of TDI, MDI, and polyol products sold as components of urethanes "systems," which are formulated packages of chemicals that include isocyanates, polyols, and auxiliary chemicals and additives such as blowing agents, fire retardants, surfactants and catalysts. During the conspiracy period, systems comprised only 1.3% of the Plaintiffs' purchases from Defendants.
- (40) Additionally, I was not asked to calculate overcharges on purchases of certain polyols commonly referred to as "polyalkylene glycols,"<sup>5</sup> which are used in "non-urethanes" applications, including synthetic lubricants and functional fluids, surfactants, personal care products and pharmaceuticals.<sup>6</sup>
- (41) In sections 5.1.3, 5.1.4, and 5.1.5, I discuss TDI products, MDI products, and polyether polyol products, respectively. In section 5.1.6, I discuss polyester polyol products.

### 5.1.3. TDI products

- (42) "TDI" is an acronym for toluene di-isocyanate. TDI is a derivative of the chemical toluene.
- (43) The primary commercial use for TDI is the manufacture of flexible polyurethane foam. In 2004, approximately 86% of NAFTA TDI consumption was used to make flexible foams.<sup>7</sup>

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<sup>3</sup> Price-fixing claims based on purchases of polyester polyols were brought in a separate litigation, as discussed in section 5.2.6.

<sup>4</sup> Pure ethylene oxide-based polyols, PTMEG polyols, and prepolymers were excluded from the class certified in this matter. See Memorandum and Order on Class Certification (for polyether polyols), *In re Urethane Antitrust Litigation*, MDL No. 1616 (D. Kan.), July 28, 2008, at 7, 8.

<sup>5</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 9.

<sup>6</sup> SRI Consulting, "Polyalkylene Glycols," *CEH Marketing Research Report*, June 2007, at 7.

<sup>7</sup> API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775).

Approximately 13% was used in CASE applications, and the remaining 1% was used in binder applications.

- (44) For most end-use applications, TDI is combined with polyols. TDI and polyols are combined in fixed proportions by weight (or volume). The specific formula is determined by the particular end-use application.<sup>8</sup>
- (45) The use of TDI and polyols (and MDI and polyols) in fixed proportions is a consequence of chemistry.<sup>9</sup> The input chemicals—i.e., the TDI and/or MDI, and polyols—must be mixed in specific ratios to get the desired properties of the output—e.g., a foam of a particular density or rigidity or a coating with certain curing and adhesive characteristics. In economic terms, products consumed in fixed proportions are “perfect complements.”<sup>10</sup>
- (46) TDI products are commonly classified by the ratio of what are called the 2,4 and 2,6-isomers. The most common TDI product is “TDI 80/20,” which is a mixture of 80 parts of the 2,4-isomer and 20 parts of the 2,6-isomer.<sup>11</sup> Other mixtures that are sold in small volumes commercially are “TDI 65/35” and “TDI 100.”

### 5.1.3.1. TDI 80/20

- (47) As indicated in Figure 6, during the conspiracy period, TDI 80/20 accounted for approximately 95% of total TDI sales.

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<sup>8</sup> Deposition of Christopher Rieker, July 26, 2010, 160–61, 191–94; Deposition of Larry Berkowski, Dec. 17, 2009, 212–13.

<sup>9</sup> “[W]hen you look at the chemistry of polyurethanes, you need a certain ratio of the polyol to the isocyanates, they—and that ratio is determined by chemistry.” Rieker Dep. 192. See also Rieker Dep. 160–61. “[T]here is a stoichiometric ratio within those applications when it comes to how much polyol, how much MDI, how much TDI do you need in a certain application to get the desired product properties.”

Dr. Rieker started working for BASF in 1990, after acquiring a PhD in chemistry from the University of Innsbruck. He served as BASF Coordination Center’s director of global marketing for polyurethane basic products. Rieker Dep. 12–15.

<sup>10</sup> See, e.g., Hal Varian, *Intermediate Microeconomics*, 7th ed. (New York: W.W. Norton & Co., 2006), 324, 325. “Suppose that we are producing holes and that the only way to get a hole is to use one man and one shovel. Extra shovels aren’t worth anything, and neither are extra men. Thus the total number of holes you can produce will be the minimum of the number of men and the number of shovels that you have.” This is “like the case of perfect complements in consumer theory.”

For consumers, Varian offers the examples of left shoes and right shoes. **“Perfect complements** are goods that are always consumed together in fixed proportions. In some sense the goods ‘complement’ each other. A nice example is that of right shoes and left shoes. The consumer likes shoes, but always wears right and left shoes together. Having only one out of a pair of shoes doesn’t do the consumer a bit of good.” *Id.* at 40 (emphasis in original).

<sup>11</sup> Deposition of John Phelps, Sept. 23, 2009, 167–68. Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 634.

**Figure 6 Defendants' US sales of TDI products, 1994–2003**

Product class	Defendants' US sales to direct action plaintiffs (\$ millions)	Defendants' US sales to all purchasers (\$ millions)	Percentage of Defendants' total US sales to direct action plaintiffs	Percentage of Defendants' total US sales to all purchasers
TDI 80/20	\$ 2,214.1	\$ 4,835.9	98.4%	94.7%
TDI 65/35	\$ 12.1	\$ 88.2	0.5%	1.7%
TDI 100	\$ 0.5	\$ 59.3	0.0%	1.2%
MDI/TDI Blend	\$ 12.6	\$ 21.5	0.6%	0.4%
Unclassified	\$ 10.5	\$ 99.8	0.5%	2.0%

Source: Combined transaction database

(48) TDI 80/20 is widely considered within the industry to be a “commodity” product.<sup>12</sup> All TDI suppliers, including all Defendants, manufactured and sold fungible TDI 80/20 products during the conspiracy period. Customers could readily substitute from TDI 80/20 made by one supplier to TDI 80/20 made by another supplier.<sup>13</sup> Defendants regularly sold TDI 80/20 manufactured by other Defendants.<sup>14</sup> As a senior Dow executive explained, “TDI is TDI is TDI.”<sup>15</sup>

<sup>12</sup> See, e.g., Deposition of Phillip Cook, May 5, 2010, 150 (“Commodity, I would define, as A, it's fungible, it's available in effectively the same form and function for multiple suppliers. We think of iron, copper, you know, hydrochloric acid, caustic soda, the molecule doesn't change, it is what it is. . . .”); Deposition of Robert Lawrence, November 28, 2010, 77–78 (“Q. Do you have an understanding of what it means to be a commodity chemical? A. Yes. Go ahead. Q. What's your understanding? A. Interchangeable. Q. Was TDI a commodity chemical, in your view? A. The 80/20, yes...The normal foamer, the big market, is a commodity chemical...You can put BASF material on top of Dow material, the customer will not know the difference.”); Deposition of William Lizzi, May 6, 2010, 55 (“Q. What do you mean—what products are you referring to as ‘commodity products’? A. Commodity product is a product that has the same specifications no matter which company produces it, so if you're going to sell TDI into the market place, a customer can buy that product from whomever they wish, it still has the same exact specifications. Q. So TDI is one of the commodity products you were referring to? A. Yes, correct.”).

<sup>13</sup> See, e.g., SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 12; Phelps Dep. 393–94; Lawrence Dep. 77–78; TDCC\_PU429274–329 at 39; and HC001096687–725 at 20. Hickory Springs mixed together TDI it received from various suppliers. Conversation with David Underdown, April 5, 2011.

<sup>14</sup> Defendants would do this regularly in the course of business to avoid shipping products long distances as part of “geographic swaps” of TDI. See, e.g., Deposition of Marco Levi, May 21, 2010, 754–55; Deposition of Uwe Hartwig, June 7–9, 2010, 247–48. In some “time swaps,” a Defendant would buy TDI from another Defendant to sell when its plant went down for planned maintenance or an unplanned outage. See, e.g., Cook Dep. 70–71. See also Deposition of Patrick Dawson (Dow), March 9, 2010, 50–52. “[F]or a period of time you give me product while I'm doing my maintenance turnaround, and then there is a reciprocal to that, when you take your plant down to maintain it, I will give you that material back . . . the key part of that is you have to still be able to supply your customers and to give your customers the service that they—that they require.”

<sup>15</sup> Cook Dep. 71.  
Cook held oversight responsibility for urethanes chemicals, meaning that Dow's president of the global polyurethanes business reported to him, and Cook himself reported to Dow's CEO. Cook Dep. 19–21.

### 5.1.3.2. Other TDI products

- (49) As shown in Figure 1, products other than TDI 80/20 comprised less than 5% of sales during 1994–2003. These other products included TDI 65/35, which is a mixture of 65 parts of the 2,4-isomer and 35 parts of the 2,6-isomer; TDI 100, which is virtually a pure form of the 2,4-isomer; and various low-volume “crude” TDI products comprised mostly of TDI 80/20 mixed with other materials.<sup>16</sup>
- (50) These TDI products are not typically used in the same applications as TDI 80/20. TDI 65/35 is generally used in prepolymer applications.<sup>17</sup> TDI 100 is used in rigid foam and prepolymer applications.<sup>18</sup>
- (51) Plaintiffs purchased a small amount of these other TDI products. Plaintiffs spent over \$2.2 billion on TDI 80/20 from 1994 to 2003 and less than \$25 million on other TDI products.<sup>19</sup>
- (52) Although Bayer reportedly was the only TDI producer that manufactured TDI 65/35 and TDI 100,<sup>20</sup> transactional data produced by Lyondell also shows some sales of these products. Both Dow and Bayer produced crude TDI products.<sup>21</sup>
- (53) Plaintiffs also purchased a small amount of TDI blended with MDI. The MDI/TDI blends listed in Figure 6 are those blends with a greater percentage of TDI than MDI (i.e., are more than 50% TDI). TDI/MDI blends are discussed in more detail in Section 5.1.4.4.

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<sup>16</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 13. “The bulk of TDI used commercially, which is mostly for flexible polyurethane foam, is a mixture of 80 parts of the 2,4-isomer and 20 parts of the 2,6-isomer. A 65/35 mixture of these isomers and the pure 2,4-isomer is also commercially available but not widely used. Also in commercial use in the United States as low-volume specialty products are so-called crude TDI products, which contain mostly 80/20 TDI but also various trimers and/or prepolymers.”

<sup>17</sup> Bayer Mondur TD Product Information Bulletin, 1, <http://www.bayermaterialsciencenafra.com/resources/d/document.cfm?Mode=view&f=1F028414-DC10-16BA-C0CA19C8E3AECD0E&d=1F1A2630-E475-1D88-58DEE0996FF835D4>, accessed April 10, 2011.

<sup>18</sup> Bayer Mondur TDS Product Information Bulletin, 1, <http://www.bayermaterialsciencenafra.com/resources/d/document.cfm?Mode=view&f=2A20AB41-BA7C-2633-DA961D174AD48B7F&d=37DA0316-BBA1-611D-B9D24B410059CC4C>, accessed April 10, 2011.

<sup>19</sup> Plaintiffs spent an additional \$12.6 million on TDI/MDI blends, which are discussed in section 5.1.4.4.

<sup>20</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 23. “Of the TDI producers, all produce the 80/20 isomer mixture, but only Bayer also produces the 65/35 isomer mixture (less than 30 million pounds) and 2,4-TDI (less than 5 million pounds).”

<sup>21</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 23. “TDI products containing so-called crude product (i.e., distillation bottom fractions and/or TDI prepolymer) are produced in comparatively small quantities by Dow and Bayer (less than 40 million pounds combined).”

### 5.1.4. MDI products

(54) “MDI” is an acronym for methylene diphenyl di-isocyanate. MDI is a derivative of benzene. Compared to TDI products, Defendants manufacture a wider range of MDI products. MDI products are commonly classified in four categories: polymeric MDI; monomeric MDI, also known as “pure” MDI because it is made by distilling polymeric MDI; modified MDI; and MDI/TDI blends.

#### 5.1.4.1. Polymeric MDI

(55) As indicated in Figure 7, from 1994 to 2003, polymeric MDI (PMDI) comprised approximately 81% of MDI sales in the United States.

**Figure 7 Defendants’ US sales of MDI products, 1994–2003<sup>22</sup>**

Product class	Defendants' US sales to direct action plaintiffs (\$ millions)	Defendants' US sales to all purchasers (\$ millions)	Percentage of Defendants' total US sales to direct action plaintiffs	Percentage of Defendants' total US sales to all purchasers
Polymeric	\$ 533.8	\$ 6,531.6	73.6%	81.6%
Modified	\$ 76.2	\$ 691.4	10.5%	8.6%
Monomeric	\$ 109.0	\$ 538.3	15.0%	6.7%
MDI/TDI Blend	\$ 0.0	\$ 78.5	0.0%	1.0%
Unclassified	\$ 6.3	\$ 165.6	0.9%	2.1%

Source: Combined transaction database

(56) The primary commercial use for polymeric MDI is manufacturing rigid foams and binders. In 2004, approximately 60% of polymeric MDI consumed in the NAFTA region was used to make rigid foams, and approximately 25% was used in binder applications. Flexible foams accounted for approximately 11%. CASE applications accounted for approximately 4%.<sup>23</sup>

(57) In foam and CASE applications, MDI is combined in fixed proportions with a polyol.<sup>24</sup> The proportion can vary according to the specific MDI and polyol in question. In binder

<sup>22</sup> Those products that we have been unable to classify as polymeric, modified, monomeric, or MDI/TDI blends have been classified as “Unclassified.”

<sup>23</sup> API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775).

<sup>24</sup> See *infra* ¶¶ (44)–(45). See also Rieker Dep. 193.

applications, polyols are typically not used, although in some cases MDI is combined with a polyol to enhance adhesive properties.<sup>25</sup>

(58) There are many grades of polymeric MDI, and Defendants' transaction data show that polymeric MDI sales were concentrated in three major product lines. Figure 8 shows the top 12 polymeric MDI products in those three lines, which accounted for approximately 74% of Defendants' overall polymeric MDI sales from 1993 to 2003.

**Figure 8 Defendants' US sales of top polymeric MDI products, 1994–2003**

Polymeric MDI classification	Product name	Supplier	Defendants' US sales to all purchasers (\$ millions)	Percentage of Defendants' total US sales to all purchasers
Standard Functionality PMDI	Mondur MR	Bayer	\$ 722.0	11.1%
	Rubinate M	Huntsman	\$ 707.6	10.8%
	Papi 27	Dow	\$ 329.8	5.0%
	Lupranate M 20S	BASF	\$ 248.3	3.8%
High Functionality PMDI	Rubinate 1850	Huntsman	\$ 706.4	10.8%
	Mondur 489	Bayer	\$ 587.1	9.0%
	Lupranate M 70L	BASF	\$ 357.0	5.5%
	Papi 580 N	Dow	\$ 242.8	3.7%
PMDI Binder	Rubinate 1840	Huntsman	\$ 602.6	9.2%
	Mondur 541	Bayer	\$ 198.9	3.0%
	Isobind 1088	Dow	\$ 46.7	0.7%
	Lupranate M 20SB	BASF	\$ 45.2	0.7%
Subtotal			\$ 4,794.4	73.4%
All Other PMDI			\$ 1,737.3	26.6%

Source: Combined transaction database

(59) All Defendants (except Lyondell, which did not manufacture MDI) sold the major grades of polymeric MDI. Different suppliers' formulations varied slightly, but, in general, purchasers could substitute one supplier's product for that of another supplier with only small modifications.<sup>26, 27, 28</sup> For example, a purchaser could substitute within a polymeric MDI

<sup>25</sup> Huber used polyols as an additive to MDI to speed the curing process. Over time, Huber identified ways to improve its production process, and Huber ultimately learned that polyols were no longer necessary. Conversation with Alan Weber, March 31, 2011.

<sup>26</sup> See, e.g., Thorsten Gurke, "New Advances in Polymeric MDI Variants," June 2002, [http://www.huntsman.com/pu/Media/Paper\\_New\\_advances\\_in\\_polymeric\\_MDI\\_variants.pdf](http://www.huntsman.com/pu/Media/Paper_New_advances_in_polymeric_MDI_variants.pdf), accessed April 10, 2011. "[Polymeric MDI] has been recognised for over 40 years and is considered as a commodity product." Gurke was Application and Product Development Manager for Adhesives for Huntsman Polyurethanes in Belgium. Cook Dep. 30: "Q. When you say 'commodity products,' what do you mean? A. MDI, TDI, polyols, phenol

classification in Figure 8, so a purchaser of Bayer's Mondur MR product could substitute to Huntsman's Rubinate M, Dow's Papi 27 or BASF's Lupranate M 20S with only small adjustments.<sup>29</sup> Furthermore, Defendants had the ability to replicate products sold by other suppliers.<sup>30</sup>

(60) In sum, polymeric MDI is considered to be a commodity product, and polymeric MDI products are considered to be fungible.

#### 5.1.4.2. Monomeric MDI

(61) As indicated in Figure 7, monomeric MDI (MMDI) comprised approximately 7% of MDI sales. The primary commercial use for monomeric MDI is in CASE applications. In 2004, approximately 77% of monomeric MDI used in the NAFTA region was used in CASE applications, and approximately 23% was used in thermoplastic polymers.<sup>31</sup>

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acetones, things that are sold by specification, so that one producer's products is [sic] generally easily substitutable for somebody else's. TDI and MDI are a reasonably good example of that." See also Deposition of Michelle Blumberg, July 21, 2010, 124–25; Deposition of Gregory Pelts, April 15, 2010, 35; Deposition of Bruce O'Brien, July 21, 2010, 86.

<sup>27</sup> For example, Huber often received Huntsman-manufactured polymeric MDI from Bayer, and Huber stored polymeric MDI purchased from different suppliers at each plant within one large tank, mixing it together. Conversation with Alan Weber, March 31, 2011.

<sup>28</sup> As with TDI, Defendants themselves recognized that polymeric MDI products often had close substitutes, and Defendants swapped or sold polymeric MDI to one another. See, e.g., Deposition of Anthony Hankins, Feb. 4, 2010, 168 and Deposition of Steven Hubrecht, July 8, 2010, 167.

<sup>29</sup> See, e.g., BASF Corporation US 503265, TDCC\_PU0585099-111 at 107 and HC001172917-31 at 25.

<sup>30</sup> Keith Day, a Huntsman Vice President, explained:

Polymeric MDI, we have 25 or 26 grades of polymeric MDI. They are fundamentally the same product. One might have a slightly lower level of chlorides allowed or a higher level of iron or things like that. In other words, it's a—we have the grade because it's a customer specification.

So what we sell to Firestone, for instance, is what they need in their process, and it might be slightly different than what we sell to another one of our customers. But it'd all be polymeric, and fundamentally our competition could replicate those products, so they're undifferentiated from that perspective.

They're different products in our product line, but the competition has something to match them, and that's what we would refer to as undifferentiated. (Deposition of Keith Day, June 9, 2010, 129)

Day has held a variety of positions at Huntsman/ICI dating back to 1987. He has been in charge of automotive, footwear, and nonrigid foam sales. Day Dep. 13–22. He currently reports directly to the president of Huntsman's Polyurethanes Division. Hankins Dep. 19.

<sup>31</sup> API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775). These percentages exclude the monomeric MDI used in reaction injection molding (RIM). RIM "polyurethanes are usually supplied as systems." API 2004 End Use Market Survey, 239 (HC008178997). Only 20% of monomeric MDI is used in RIM systems. API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775).

(62) Because of its relatively small sales volume, monomeric MDI is sometimes termed a “speciality” product.<sup>32</sup> Like polymeric MDI, however, all MDI producers sold monomeric MDI,<sup>33</sup> offered a variety of grades, and generally had the ability to replicate products sold by other suppliers.<sup>34</sup>

#### 5.1.4.3. Modified MDI

(63) Modified MDI products are derived from polymeric and monomeric MDI products.<sup>35</sup> Specifically, modified MDI products are made by mixing polymeric MDI and monomeric MDI products with each other and/or with various chemicals. These modified MDI products are produced for two primary reasons: (1) to stabilize an MDI product for transport and storage,<sup>36</sup> and (2) to customize an MDI product for a customer with specific product requirements.<sup>37</sup> Modified MDI products tend to be more specialized than polymeric and monomeric MDI products.<sup>38</sup>

(64) Modified MDI accounted for approximately 9% of MDI sales during the conspiracy period. Typical uses of modified MDI include flexible foam, CASE applications, appliance/insulation, and automotive applications.<sup>39</sup> All Defendants other than Lyondell sold modified MDI.<sup>40</sup>

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<sup>32</sup> For instance, SRI says that “[t]he diisocyanates and polyisocyanates industry includes a variety of products, some of which are commodity chemicals—TDI and [polymeric] MDI—and others are specialties—pure MDI and aliphatic and cycloaliphatic diisocyanates.” SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 11.

<sup>33</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 21.

<sup>34</sup> Day Dep. 129.

<sup>35</sup> One type of modified MDI, MDI “prepolymers,” is formed by partially reacting MDI with a polyol to create a product that is more convenient for the end user. These products are not part of this litigation. See *infra* ¶ (37).

<sup>36</sup> For example, monomeric MDI has a limited shelf life of approximately two weeks. Deposition of John Quackenbush, Aug. 11, 2010, 148–49; Hartwig Dep. 538; Tecnon OrbiChem, *MDI World Study 1998–2010*, BASF Corporation US 1128261–352 at 281.

<sup>37</sup> BASF 2009 MDI Handbook, 8, [http://www2.bASF.us/urethanechemicals/Specialty\\_Systems/pdfs/mdihandbook.pdf](http://www2.bASF.us/urethanechemicals/Specialty_Systems/pdfs/mdihandbook.pdf), accessed February 2, 2010.

<sup>38</sup> Tecnon OrbiChem, *MDI World Study 1998–2010*, BASF Corporation US 1128261–352 at 281-282.

<sup>39</sup> Combined transaction database; BASF 2009 MDI Handbook, 8-9, [http://www2.bASF.us/urethanechemicals/Specialty\\_Systems/pdfs/mdihandbook.pdf](http://www2.bASF.us/urethanechemicals/Specialty_Systems/pdfs/mdihandbook.pdf), accessed February 2, 2010.

<sup>40</sup> Combined transaction database.

#### 5.1.4.4. MDI/TDI blends

- (65) Just as polymeric and monomeric MDI can be blended, so can MDI and TDI. MDI/TDI blends are commonly used to make high-density flexible slabstock and high-resiliency molded flexible foams in transportation and furniture applications.<sup>41</sup>
- (66) MDI/TDI blends accounted for approximately 1% of MDI sales during the conspiracy period. BASF, Bayer, Dow, and Huntsman all sold MDI/TDI blends.<sup>42</sup> The MDI/TDI blends listed in Figure 7 are those blends with a greater percentage of MDI than TDI (i.e., are 50% or more MDI).

#### 5.1.5. Polyol products

- (67) A polyol is a chemical compound that contains two or more hydroxyl groups.<sup>43, 44</sup> Polyether polyols are synthetic (man-made) polyols derived from propylene oxide (PO) and/or ethylene oxide (EO).
- (68) Because polyols are predominantly used in combination with TDI and MDI, the demand for polyols is largely driven by the same applications and business segments that use TDI and MDI. In 2004, approximately 67% of polyols were used to make flexible foams,<sup>45</sup> approximately 19% were used to make rigid foams, approximately 12% were used in CASE applications, and approximately 2% were used in binders.
- (69) There are a wide range of polyols, which are generally classified by functionality, molecular weight, and a property known as the hydroxyl number.<sup>46</sup> The particular properties of the polyol, along with the properties of the TDI and/or MDI with which the polyol is combined, determine the characteristics of the end polyurethane product.

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<sup>41</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 31, 36.

<sup>42</sup> Combined transaction database.

<sup>43</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 10.

<sup>44</sup> A hydroxyl group is the combination of a single oxygen and a single hydrogen molecule, OH. BASF Pluracol Polyol Handbook, BASF Corporation US 1800956–68 at 965.

<sup>45</sup> API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775). These percentages exclude the polyols used in reaction injection molding (RIM). RIM “polyurethanes are usually supplied as systems.” API 2004 End Use Market Survey, 239 (HC008178997). Only 3% of polyether polyols are used in RIM systems. API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775).

<sup>46</sup> The hydroxyl (OH) number represents the OH equivalents per unit of weight provided by polyols. Flexible polyols generally have OH numbers of 35 to 60, and rigid polyols have larger OH numbers. SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 26, 62.

(70) Figure 9 displays the sales during the conspiracy period of the major categories of polyol products. Polyols used to manufacture flexible foam are generally classified into three categories: conventional flexible slab (CFS), copolymers, and high-resilience (HR) flexible. As shown on Figure 9, CFS polyols comprised the largest product category; they accounted for over 35% of sales during the conspiracy period.

**Figure 9 Defendants' US sales of polyether polyol products, 1994–2003**

Product class	Defendants' US sales to direct action plaintiffs (\$ millions)	Defendants' US sales to all purchasers (\$ millions) <sup>47</sup>	Percentage of Defendants' total US sales to direct action plaintiffs	Percentage of Defendants' total US sales to all purchasers
CFS	\$ 1,094.2	\$ 2,687.7	43.6%	35.6%
Copolymer	\$ 505.9	\$ 1,325.6	20.2%	17.6%
HR Flexible	\$ 457.5	\$ 981.8	18.2%	13.0%
Rigid	\$ 24.3	\$ 374.8	1.0%	5.0%
Unclassified	\$ 425.4	\$ 2,175.6	17.0%	28.8%

Source: Combined transaction database

(71) To classify polyol products, I relied upon information provided by defendants and plaintiffs, as well as research by my support team. My team reviewed technical specifications, which included product characteristics including molecular weight, hydroxyl number, and functionality.<sup>48</sup> Where appropriate, I classified products by comparing their technical specifications with guidelines published in trade publications such as SRI Consulting's *Marketing Research Report*.<sup>49</sup> I instructed my team members to focus their research on the

<sup>47</sup> Lyondell polyol sales to non-Plaintiffs in 1994, 1996, and 1997 are not contained in this figure. See footnote 363.

<sup>48</sup> Molecular weight is the sum of atomic weights of all the atoms in a molecule. See, e.g., BASF Pluracol Polyol Handbook, BASF Corporation US 1800956–68 at 965.

Hydroxyl number is defined in footnote 46.

Functionality is the number of reactive groups per molecule. See, e.g., The Dow Chemical Company, Flexible Polyurethane Foams, HC008370328–807 at 724.

<sup>49</sup> Conventional flexible slab polyol products typically have a molecular weight of 3,000 to 3,700 and a hydroxyl number of 47 to 58. Deposition of Martin Cosgrove, June 29, 2010, 85–86; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 25–26.

Copolymers were identified using discovery documents, product technical data sheets, and Defendant data.

HR flexible polyol products typically have a molecular weight of 4,500 to 6,500 and a hydroxyl number of 27 to 35. SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 26.

Polyols used in rigid foam applications typically have molecular weight of 250 to 1,000, functionality of 4 to 8, and a hydroxyl number of 350 to 550. SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 30.

top 300 polyol products by sales amount, which account for 90% of all polyol sales found in the Defendant data.

(72) This approach classified 83% of Defendants' sales of polyether polyols to Plaintiffs. Polyol products that are not classified as a CFS, copolymer, HR flexible, or rigid polyol are referred to collectively in Figure 5 as "Unclassified."

### 5.1.5.1. CFS polyols

(73) CFS polyols are used to make "slabstocks" of flexible foam. Slabstock foams are made by continuously pouring mixed liquids onto a conveyor to create a constant run of flexible polyurethane foam.<sup>50</sup> CFS polyols are combined in fixed proportions with isocyanates, typically with TDI.<sup>51</sup> The proportions vary according to the specific application.<sup>52</sup>

(74) Figure 10 shows that nine of the top CFS polyol products account for 80% of total Defendant CFS polyol sales.

**Figure 10 Defendants' US sales of top CFS polyol products, 1994–2003<sup>53, 54</sup>**

Supplier	Product name	Defendants' US sales to all purchasers (\$ millions) <sup>55</sup>	Percentage of Defendants' total US sales to all purchasers
BASF	Pluracol 1385	\$ 167.8	6.2%
	Pluracol 1388	\$ 160.0	6.0%
Bayer	Multranol 7057	\$ 45.2	1.7%
	Multranol 7159	\$ 40.7	1.5%
Bayer-Lyondell	Arcol F-3022	\$ 327.5	12.2%
	Arcol F-3222	\$ 193.2	7.2%
Dow	Voranol 3137	\$ 749.7	27.9%
	Voranol 3512	\$ 252.8	9.4%
	Voranol 3010	\$ 219.8	8.2%

<sup>50</sup> Polyurethane Foam Association Glossary, <http://www.pfa.org/glossary.html>, accessed on March 22, 2011. See also BASF Pluracol Polyol Handbook, BASF Corporation US 1800956–68 at 958.

<sup>51</sup> Conversation with David Underdown, April 5, 2011. See also SRI Consulting, "Polyurethane Foams," *CEH Marketing Research Report*, October 2009, at 9; Rieker Dep. 192.

<sup>52</sup> See *infra* ¶¶ (44)–(45).

<sup>53</sup> Arcol F-3022 and Arcol F-3222 include sales by both Lyondell and Bayer. Bayer continued to sell these products after acquiring Lyondell's polyols business in 2000.

<sup>54</sup> "All other CFS Polyols" includes Huntsman's CFS polyol sales, which comprise less than 1% of CFS polyol sales.

<sup>55</sup> Lyondell polyol sales to non-Plaintiffs in 1994, 1996, and 1997 are not contained in this figure. See footnote 363.

Subtotal	\$ 2,156.9	80.2%
All Other CFS Polyols	\$ 530.8	19.8%

Source: Combined transaction database

(75) CFS polyols were sold in different grades, and products falling within a particular grade were generally viewed as commodities.<sup>56</sup> Defendants recognized that CFS polyols within a particular grade were generally interchangeable.<sup>57</sup> For example, a purchaser could substitute from Bayer's Multranol 7159 to Bayer/Lyondell's Arcol F-3222, Dow's Voranol 3137, or BASF's Pluracol 1385 with only small adjustments.<sup>58</sup> Defendants swapped or sold CFS polyol products to one another.<sup>59</sup>

### 5.1.5.2. Copolymer polyols

(76) Copolymer (also known as "CPP" or "graft") polyols are polyether polyols, typically CFS and HR flexible polyols, that have had particular solids added.<sup>60</sup> Copolymers containing a high percentage of solids are used for carpet underlay, while copolymers containing a low percentage of solids are used for molded foam applications, such as furniture and automobile seating.<sup>61</sup> Copolymers are typically blended with HR flexible polyols and TDI to make HR flexible foams.<sup>62</sup>

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<sup>56</sup> See, e.g., Deposition of Joseph York, Feb. 23, 2010, 263–64. See also Cook Dep. 30. See also Cook Dep. 153–54:

Q. I want to use that continuum that you've described with commodities on one end, where you describe them as interchangeable and fungible, and more specialized products on the other end, where they've gotten more value propositioned and there is less interchangeability and more switching costs and things like that, so if you think of that continuum, which is how you described it, can you tell me where you would put MDI, TDI and polyols on that continuum?

A. MDI and TDI are very definitely firmly in the commodity zone. A part of the polyol—flexibles—part of the flexible slab polyols, I would consider commodity-like in behavior, but that drops off pretty rapidly because past one or two grades from each supplier that are intended to be interchangeable, then it begins to differentiate itself. [...] It's really in the flexible slab vanilla sheet foam market where you get polyols that really act very commodity-like.

<sup>57</sup> See Cook Dep. 153–54. See also Cosgrove Dep. 85–86. "The commodity polyol is a polyol which is a relative standard throughout the region that you are purchasing in. So in the [US] it will be a 3,000, 3,200 molecular weight 48 OH polyol (48 hydroxyl polyol). And that specification would be a specification issued by or available from any of the major polyol manufacturers. There are slight differences—very slight differences that you may have to adjust for in the plant in reactivity in antioxidant level, but in the main they are interchangeable."

<sup>58</sup> BCPUR0276250–61 at 56.

<sup>59</sup> As with TDI and MDI products, Defendants themselves recognized that conventional flexible slab polyol products often had close substitutes, and Defendants swapped or sold conventional flexible slab polyol products to one another. Deposition of Larry Stern, Nov. 2, 2009, 341; Levi Dep. 667–68.

<sup>60</sup> Conversation with Bruce O'Brien, April 5, 2011. York Dep. 55–56. These solids are typically based on styrene and acrylonitrile. SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 13. See also *infra* ¶ (116).

<sup>61</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 13.

<sup>62</sup> Conversation with Bruce O'Brien, April 5, 2011. SRI Consulting, "Polyether Polyols for Urethanes," *CEH*

(77) Copolymers were considered to be specialty products.<sup>63</sup> BASF, Bayer, Dow, and Lyondell all sold copolymers.<sup>64</sup>

#### 5.1.5.3. High-resilient flexible polyols

(78) HR flexible polyols are used to create stronger and more resilient foam generally found in furniture and seat cushions.<sup>65</sup> HR flexible polyols are typically combined with TDI, although they may also be combined with TDI/MDI blends.<sup>66</sup>

(79) HR flexible polyols are produced in the same manner as CFS polyols but typically have additional ethylene oxide added in the process.<sup>67</sup> All Defendants supplied HR flexible polyols.<sup>68</sup> Purchasers would work with suppliers to develop optimal formulations for the purchasers' particular applications.<sup>69</sup>

#### 5.1.5.4. Rigid polyols

(80) Most polyols are used to manufacture flexible foams, but some polyols are used to manufacture foams with more rigidity.<sup>70</sup> Typically rigid foam is produced by using polymeric MDI that is mixed with rigid polyols in fixed proportions.<sup>71</sup> Rigid foams are most often used as an insulation material, particularly in construction applications, refrigeration, and appliances.<sup>72</sup>

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<sup>63</sup> *Marketing Research Report*, July 2002, at 13.

<sup>64</sup> Cosgrove Dep. 84. The products were not so specialized, however, that Defendants were unwilling to consider swaps of copolymer polyols. See Levi Dep. 727–29.

<sup>65</sup> Combined transaction database.

<sup>66</sup> York Dep. 265–66.

<sup>67</sup> “High-resilient flexible foams are based primarily on TDI; however, mixtures of TDI and p, p'-methylene diphenyl diisocyanate (MDI) in a 4:1 ratio have also been used.” SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 26.

<sup>68</sup> Conversation with Bruce O’Brien, April 5, 2011; SynUthane International Inc., *Understanding Polyurethanes* (HC000756265-267).

<sup>69</sup> Combined transaction database.

<sup>70</sup> See, e.g., York Dep. 263–64.

<sup>71</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 5.

<sup>72</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 29. See also *infra* ¶¶ (44)–(45).

<sup>73</sup> SRI Consulting, “Polyurethane Foams,” *CEH Marketing Research Report*, Nov. 2002, at 4, 33.

### 5.1.5.5. Unclassified polyol products

- (81) As the data in Figure 9 indicate, 82% of Defendants' sales of polyether polyols to Plaintiffs are for CFS polyols, copolymers, and HR flexible polyols—polyols used to make flexible foam, typically with TDI. The remaining 11% of Plaintiff purchases of polyols comprise polyols classifiable as rigid polyols as well as polyols that were not classified.<sup>73</sup>
- (82) The unclassified category contains (1) polyols my team researched which did not fit the classification criteria, (2) polyols my team researched which had no available information, and (3) polyols that were small volume, which my team did not research. Polyols in the first two categories—the ones my team researched—account for 76% of the unclassified polyol sales to all purchasers. The remaining 24% contains nearly 700 individual products. Defendants themselves noted the difficulty of properly classifying so many products in refusing to classify their own products themselves.<sup>74</sup>

### 5.1.6. Polyester polyols

- (83) Although I was not asked to calculate damages on Plaintiffs' purchases of polyester polyols, I considered whether polyester polyols were potential influences on prices of polyether polyols.
- (84) Polyester polyols, like polyether polyols, are used in a range of polyurethanes applications. However, they are made from different input chemicals,<sup>75</sup> and they are manufactured and sold

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<sup>73</sup> The CFS polyols, copolymers, and HR flexible polyols reported in Figure 9 account for approximately two-thirds of total polyols sales to all purchasers (excluding defendants). As indicated in paragraph (68), polyols used in flexible foam applications account for 67% of polyols consumption.

It is likely that the remaining polyols, which account for approximately one-third of total polyol sales to all purchasers (excluding defendants) are the ones used in non-flexible foam applications, in combination with MDI.

<sup>74</sup> During the meet and confer with Dow, my team requested additional information regarding the classification of products. Dow responded stating “Providing information of the type sought in section IV.A.4 for 1,209 separate products would impose undue burden on Dow to compile information that is irrelevant to the issues in this litigation.”, see July 29, 2010 Letter from Jeremy Evans to Doreen Manchester, response to Question IV.A.4. Dow also refused to provide product technical data sheets, stating “Dow objects to producing ‘technical datasheets’ that are not located on Dow’s website. To the extent such documents may exist, they are highly confidential and are irrelevant to the issues involved in this litigation.”, see July 29, 2010 Letter from Jeremy Evans to Doreen Manchester, response to Question IV.B.1.

<sup>75</sup> SRI Consulting, “Polyester Polyols,” *CEH Marketing Research Report*, June 2006, at 7. “Polyester polyols are manufactured from aliphatic diacids (or esters), aromatic diacids (or esters or anhydrides) and caprolactone.” See also Memorandum and Order on Class Certification (for polyester polyols), *In re Urethane Antitrust Litigation*, MDL No. 1616 (D. Kan.), August 16, 2006, 2.

by different suppliers. In the United States, Bayer, and Dow were the only Defendants to manufacture both polyether polyols and polyester polyols.<sup>76</sup>

- (85) Lyondell, Bayer, and Dow have all argued before the European Commission that polyester polyols are in a different market than polyether polyols, and the European Commission has agreed.<sup>77</sup>
- (86) In flexible foam applications, polyether polyols comprise 97% of polyols consumed, and polyester polyols comprise only 3%.<sup>78</sup> In flexible foam applications, polyester polyols and polyether polyols are used in different types of products:

Polyether and polyester polyol usage depends on the end use of the flexible foam. Polyether polyols are used primarily in foams for cushioning applications such as furniture and automotive seating. Polyester polyols are used in the production of nondurable specialty foams for textile laminates and packaging, and in reticulated foam for automobile air filters and gaskets. Use of polyester polyols in place of polyethers for flexible foams will be significant only in these miscellaneous, nondurable goods applications.<sup>79</sup>

- (87) Polyester polyols accounted for a higher percentage of consumption in rigid and nonfoam applications, but within these applications polyester polyols were generally not substitutes for polyether polyols.<sup>80</sup>

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<sup>76</sup> SRI Consulting, “Polyester Polyols,” *CEH Marketing Research Report*, June 2006, at 10. BASF produced some polyester polyols in Germany, Italy and Brazil, while Huntsman produced some polyester polyols in Germany and the United Kingdom. SRI Consulting, “Polyester Polyols,” *CEH Marketing Research Report*, June 2006, at 6 (BASF), 27–28 (Huntsman).

<sup>77</sup> “The Parties [Lyondell and Bayer] submit that the relevant product market is the market for polyether polyol, a different product market from the market for polyester polyol. Market investigation carried out by the Commission confirms that these are two distinct product markets.” Lyondell/Bayer merger approval, ¶ 9, [http://ec.europa.eu/competition/mergers/cases/decisions/m1796\\_en.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m1796_en.pdf), accessed April 13, 2011.

“DOW considers that, due to the their [sic] different physical properties and applications, polyether polyols and polyester polyols constitute distinct markets, and this view was confirmed in the Commission’s market investigation in a prior case (No.IV/M.1796 – Bayer/Lyondell of 21.02.2000).” Dow/EniChem April 6, 2001 transaction approval, ¶ 9, [http://ec.europa.eu/competition/mergers/cases/decisions/m2355\\_en.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m2355_en.pdf), accessed April 10, 2011.

<sup>78</sup> API 2004 End Use Market Survey, Table 4, p. 17 (HC008178775). SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 26.

<sup>79</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 26.

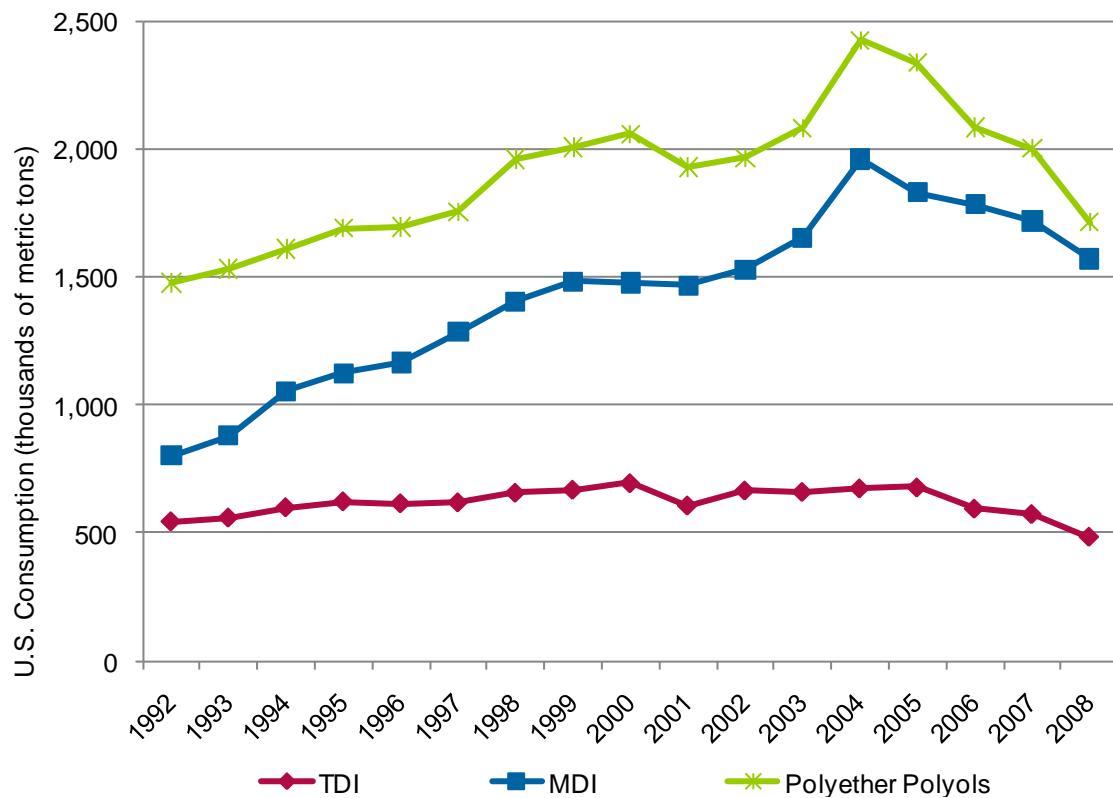
<sup>80</sup> See Deposition of Jorge Burtin, Jan. 27, 2010, 245–49 (testifying that only polyether polyols, and not polyester polyols, could be used to manufacture Skypark’s bowling balls, pool and spa filters, and materials Skypark sold to make automotive parts, including bumpers, scoops, handles, and doors).

## 5.2. Demand

### 5.2.1. Size of the industry

(88) The overall usage of TDI, MDI, and polyols grew from 1992 to 2004. Figure 11 shows that MDI consumption grew the most, by approximately 8% per year. Polyether polyols consumption increased by approximately 4% per year, and TDI consumption increased approximately 2% per year. US consumption of polyether polyols products subsequently declined after 2004.

**Figure 11 US Consumption of polyether polyol products, 1992–2008**



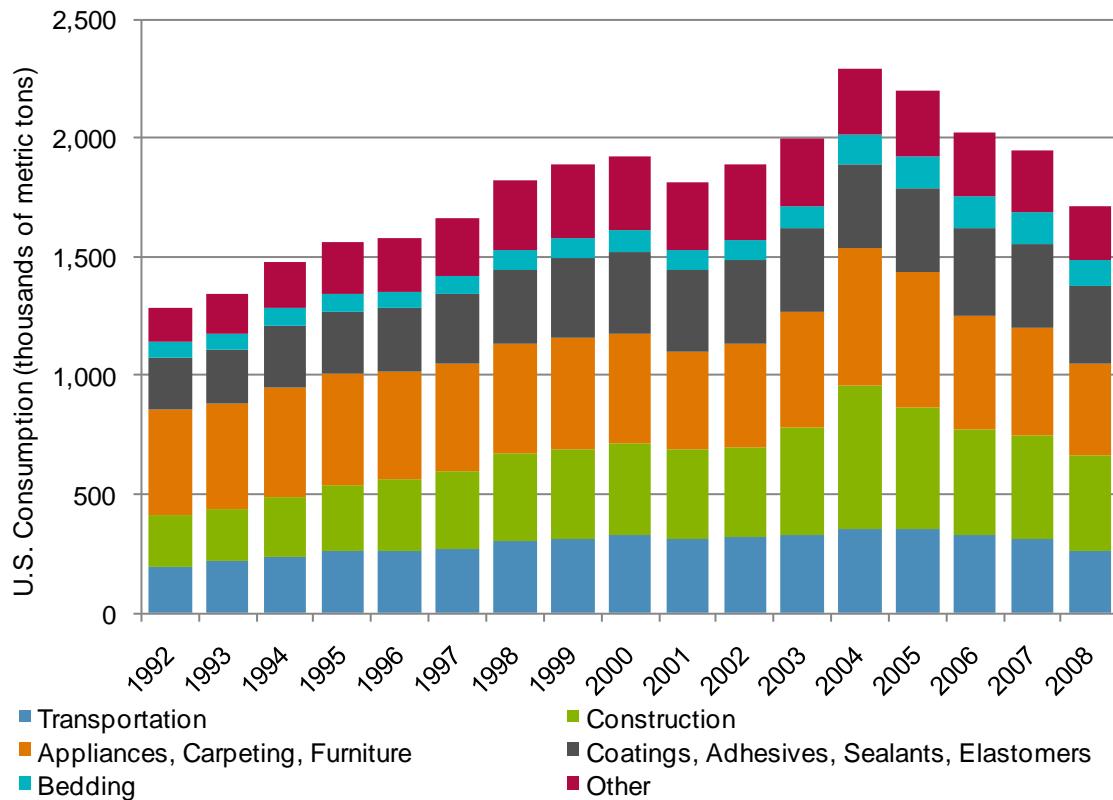
Source: SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 25, 30, 35; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 28, 33.

### 5.2.2. End uses

(89) As seen in Figure 12, TDI, MDI, and polyether polyols were used in a number of industries. From 1992 to 2008, approximately 63% of US consumption of these products was in foam

and binder uses in the transportation, construction, and appliances/carpeting/furniture end-use industries.

**Figure 12 US Consumption of polyether polyol products by end-use industry, 1992–2008**

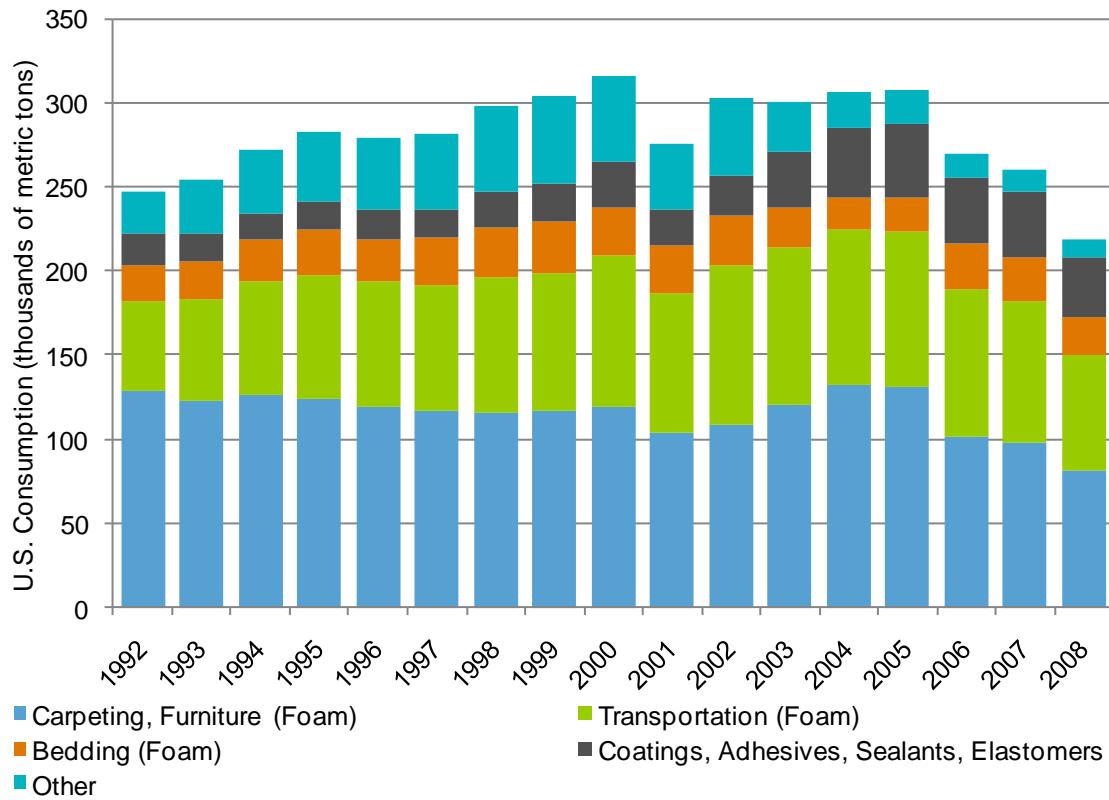


Source: SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 25, 30, 35; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 28, 30, 33, 35.

### 5.2.2.1. TDI

(90) From 1992 to 2008, foam used by the transportation, carpeting, and furniture industries accounted for approximately 69% of US TDI consumption. TDI was also used in CASE applications, primarily as a coating, and as a sealant for automotive applications.<sup>81</sup>

<sup>81</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Feb. 2002, at 32.

**Figure 13 US Consumption of TDI by end-use industry, 1992–2008**

Source: SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 28, 30.

### 5.2.2.2. MDI

(91) From 1992 to 2008, foam and binder applications in construction accounted for approximately 49% of US MDI consumption. Consumption in binder applications grew with the increased use of wood products, such as oriented strand board (OSB), in construction.<sup>82</sup> CASE applications, primarily in the construction and transportation industries, accounted for about another 22% of US MDI consumption.<sup>83</sup>

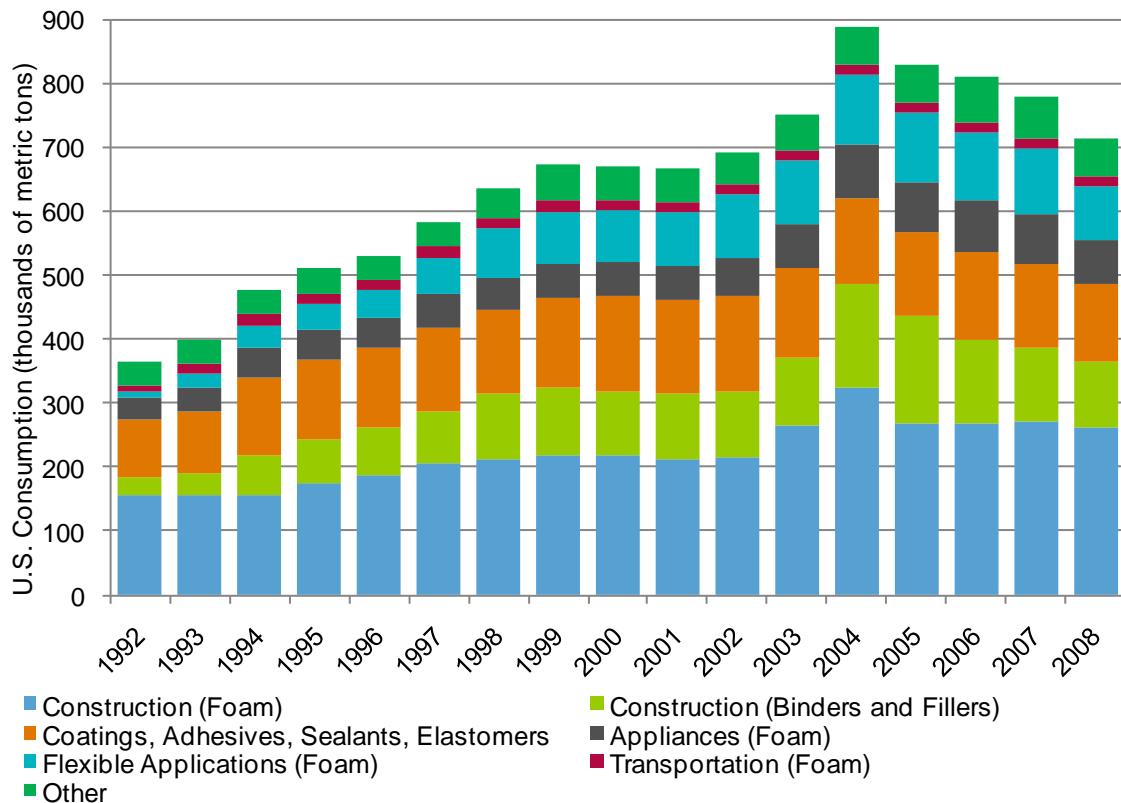
(92) Although TDI was used to a greater extent than MDI to manufacture flexible foam, the use of MDI in flexible applications increased over time, as shown in Figure 14. One reason for this

<sup>82</sup> Huntsman Confidential Information Memorandum, HC001593215–467 at 258.

<sup>83</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 37–38.

trend was increased use of high-density/high-resiliency foams in the transportation, bedding, and furniture industries.<sup>84</sup>

**Figure 14 US Consumption of MDI by end-use industry, 1992–2008**



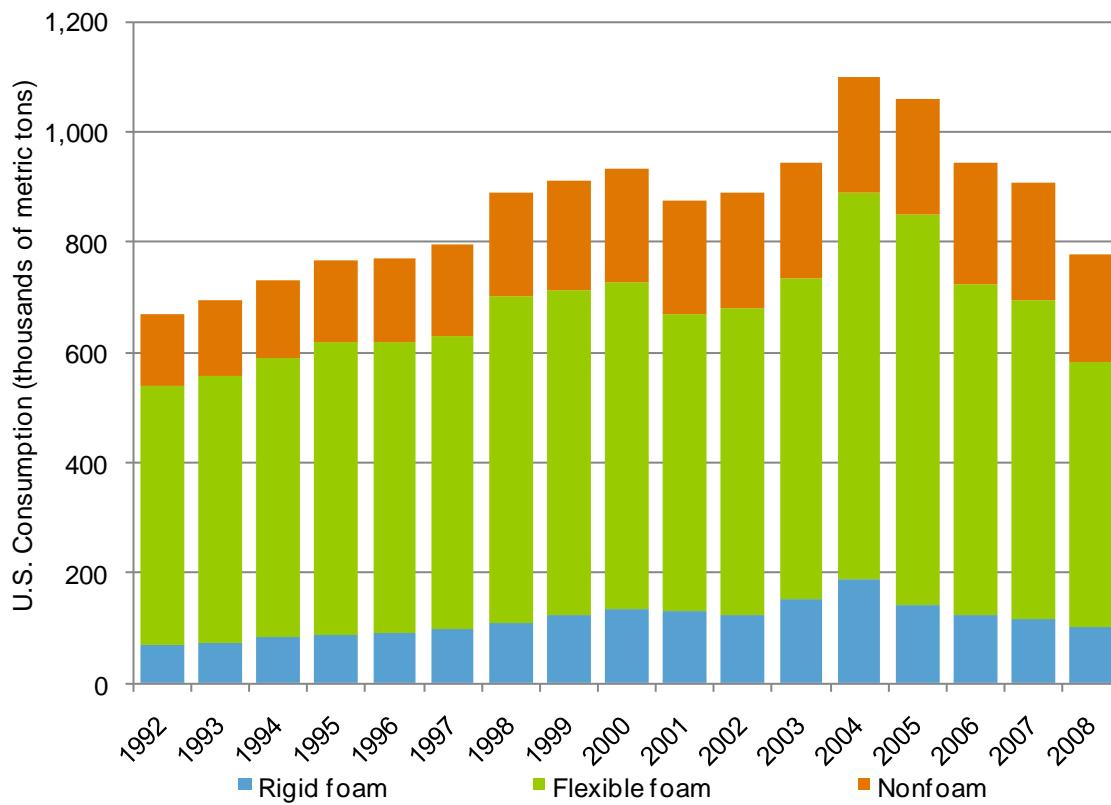
Source: SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 33, 35.

### 5.2.2.3. Polyols

(93) As indicated in Figure 15, from 1992 to 2008, in the United States polyether polyols were consumed primarily for flexible foam applications (roughly 66% annually) and rigid foam applications (roughly 13% annually). Nonfoam applications accounted for roughly 21% of US consumption from 1992 to 2008.<sup>85</sup>

<sup>84</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 35.

<sup>85</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 22.

**Figure 15 US Consumption of polyether polyols**

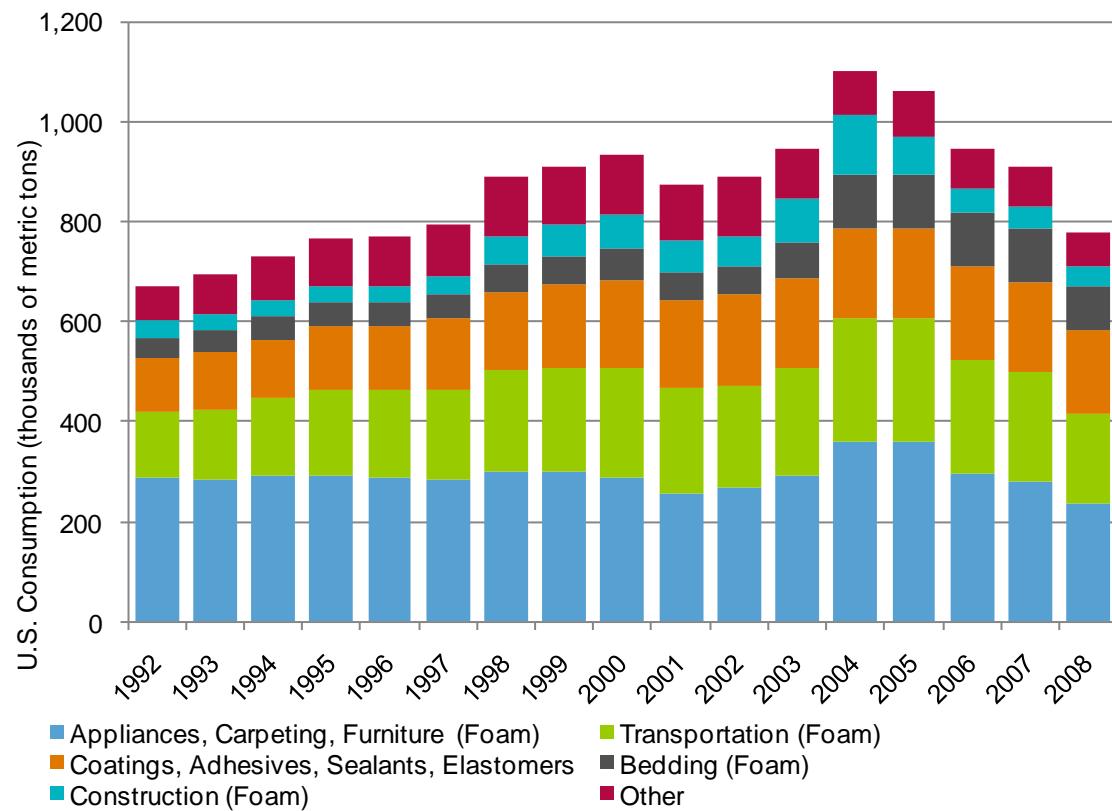
Source: SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 22.

(94) Flexible polyurethane foam was used primarily as a cushioning material in transportation, furniture, carpeting, and bedding applications.<sup>86</sup> Rigid polyurethane foam was used primarily in construction and appliances (e.g., refrigerators and hot water heaters), because of its quality as an insulator.<sup>87</sup> From 1992 to 2008, over 85% of nonfoam applications for polyether polyols were in CASE applications, primarily in the construction and transportation industries.<sup>88</sup>

<sup>86</sup> SRI Consulting, "Polyurethane Foams," *CEH Marketing Research Report*, Nov. 2002, at 4, 28.

<sup>87</sup> SRI Consulting, "Polyurethane Foams," *CEH Marketing Research Report*, Nov. 2002, at 4, 36, 39.

<sup>88</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 20, 25, 35.

**Figure 16 US Consumption of polyether polyols by end use industry, 1992–2008**

Source: SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 25, 30, 35.

### 5.2.3. US imports and exports

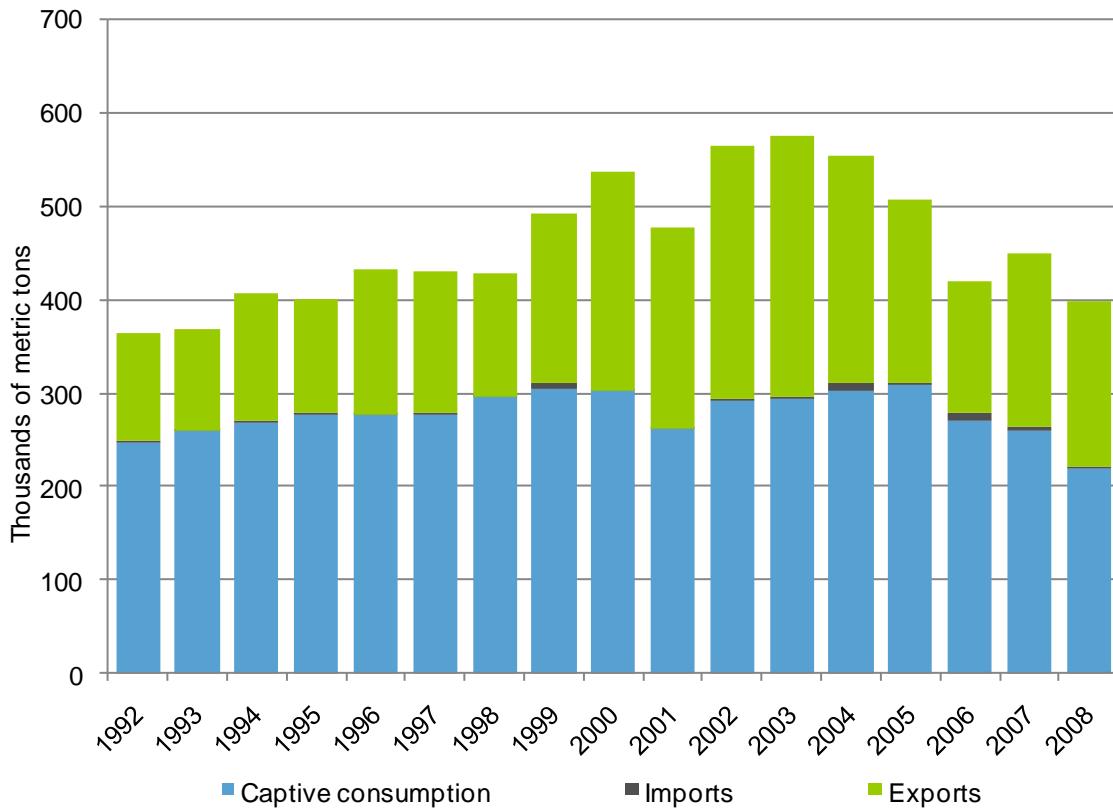
(95) In this section, I summarize information about polyether polyols product trade flows involving the United States.

#### 5.2.3.1. TDI

(96) TDI is actively traded worldwide. In 2000, US exports of TDI accounted for approximately 41% of US production.<sup>89</sup>

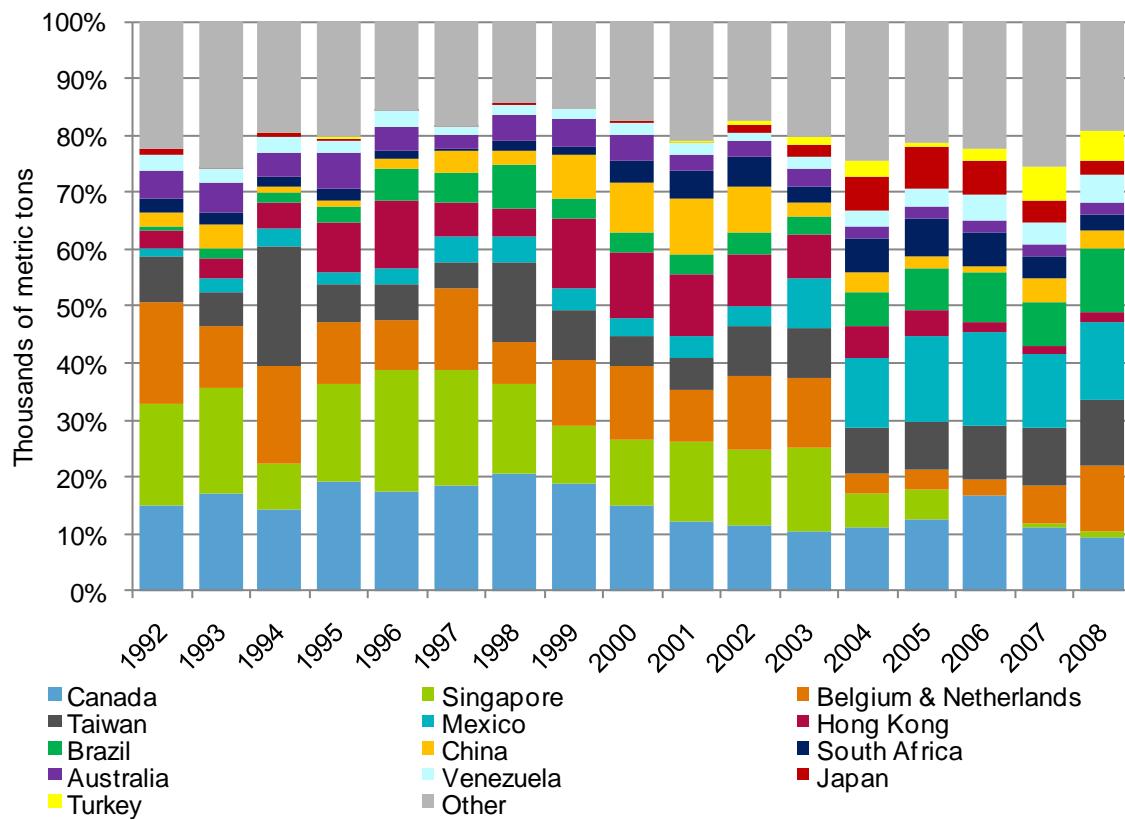
(97) The United States imported relatively little TDI. Figure 17 depicts US TDI domestic consumption, imports, and exports over time.

<sup>89</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 24.

**Figure 17 US TDI domestic consumption, imports, and exports over time**

Source: SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 24, 44-45.

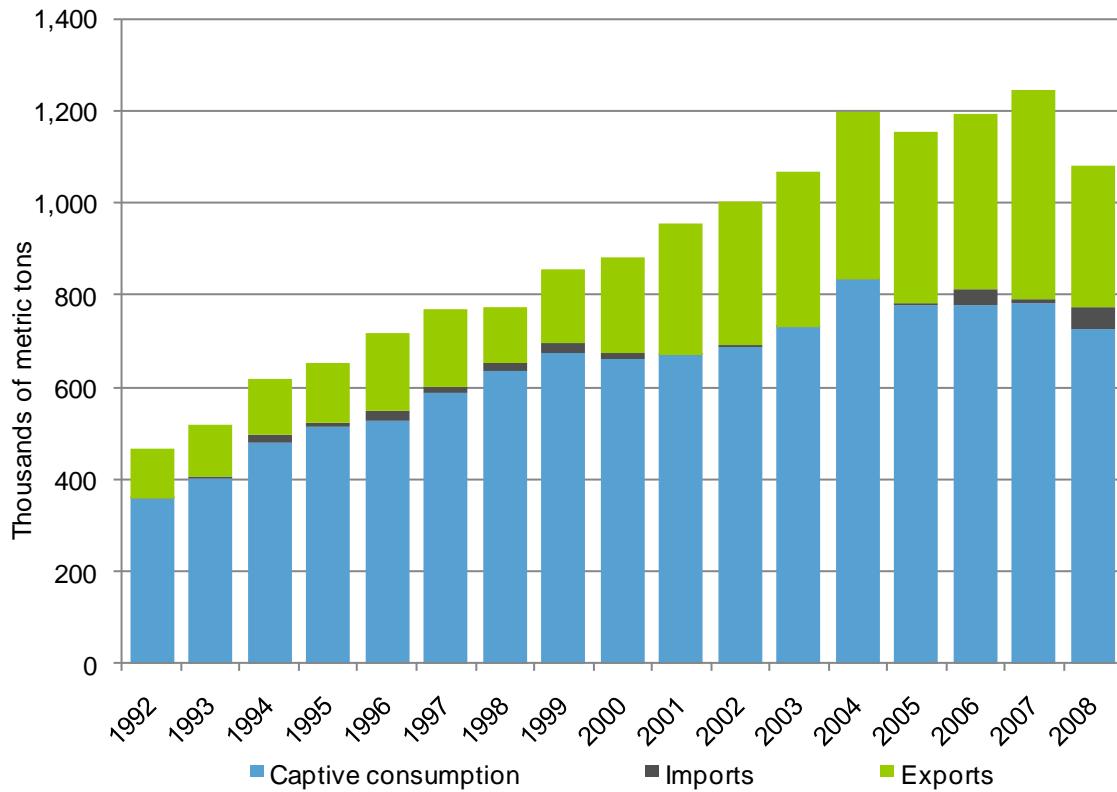
(98) As seen in Figure 18, the US exports TDI to Canada and Mexico, as well as to countries in Europe and Asia.

**Figure 18 US TDI exports by destination**

### 5.2.3.2. MDI

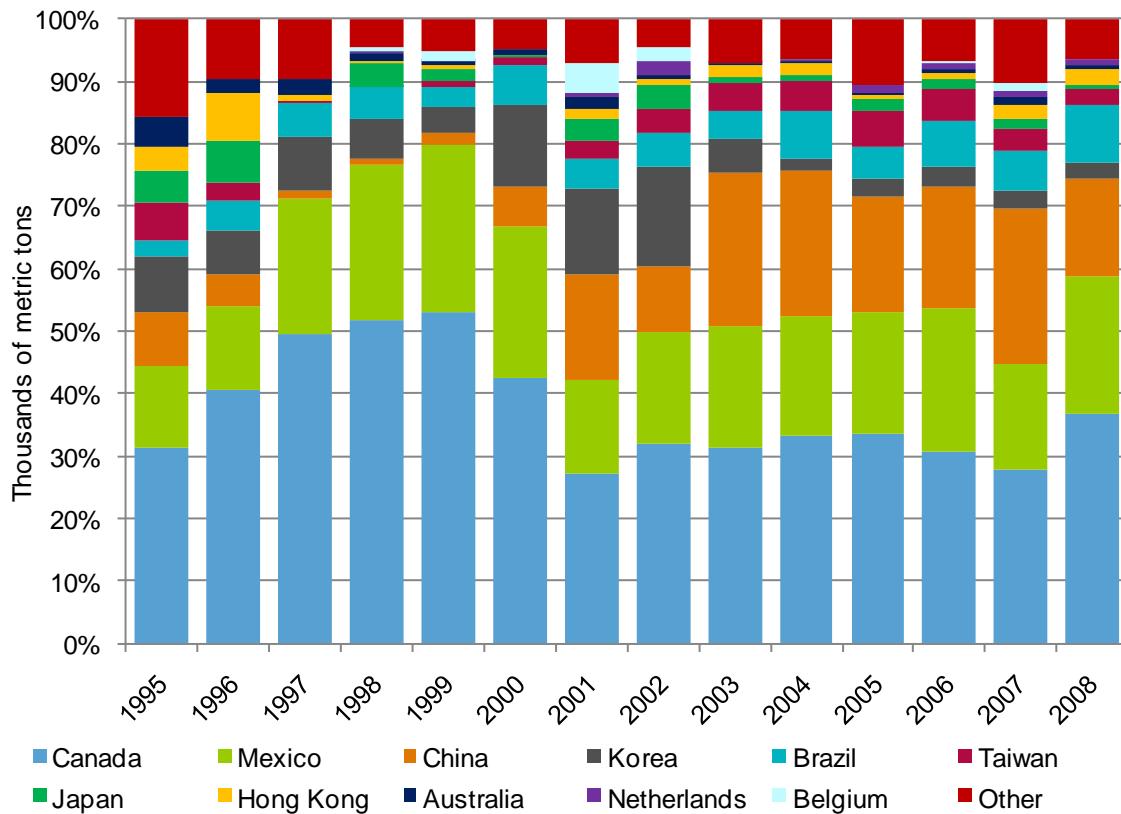
(99) Like TDI, MDI is also actively traded worldwide. In 2000, US exports of MDI made up approximately 23% of US production. This figure grew to approximately 30% in 2008.<sup>90</sup> The United States imported relatively little MDI. Figure 19 depicts US MDI domestic consumption, imports, and exports over time.

<sup>90</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 24.

**Figure 19 US MDI domestic consumption, imports, and exports over time**

Source: SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 24, 44.

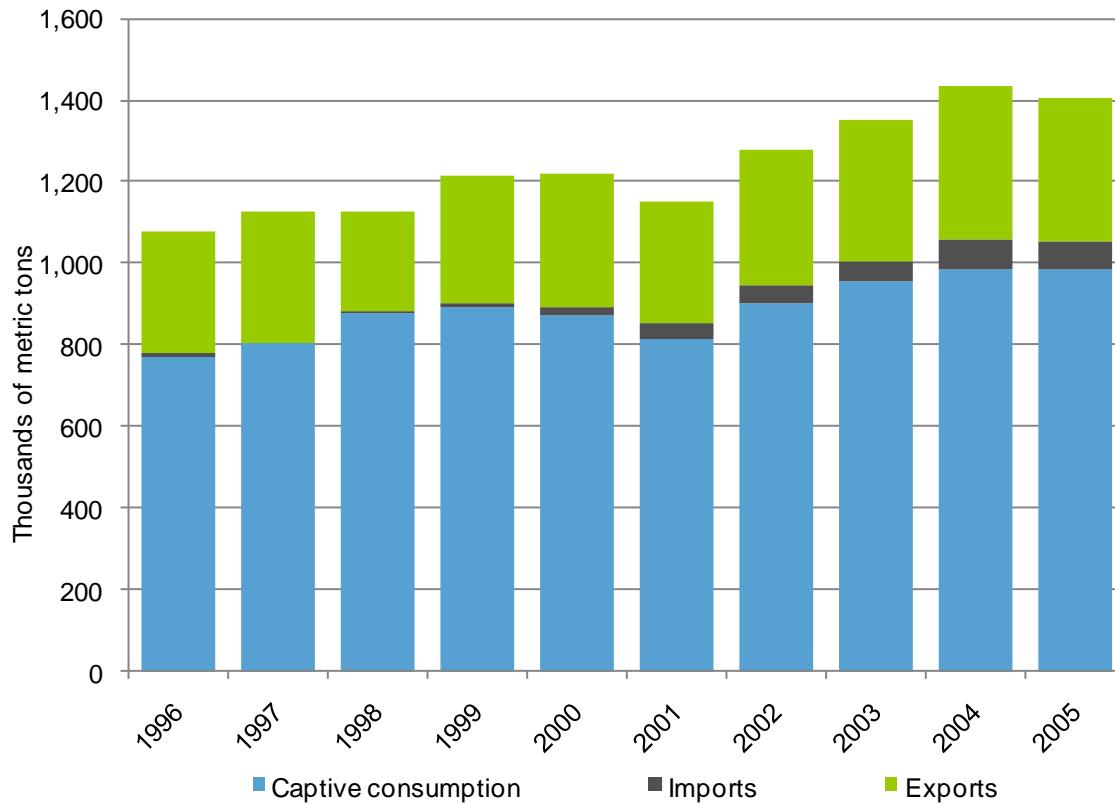
(100) As seen in Figure 20, Canada and Mexico accounted for a large fraction of US MDI exports. Exports, however, were not limited to North America. After 2000, the United States exported relatively large quantities to Asia.

**Figure 20 US MDI exports by destination**

### 5.2.3.3. Polyether polyols

(101) Like TDI and MDI, polyether polyols are actively traded worldwide. In 2000, US exports of polyether polyols made up approximately 27% of US production.<sup>91</sup> The United States imported relatively little polyether polyol. Figure 21 depicts US polyether polyol domestic consumption, imports, and exports over time.

<sup>91</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 19, 43.

**Figure 21 US Polyether polyol domestic consumption, imports, and exports over time**

Source: SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 21, 42-43. Data unavailable for entire 1992-2008 period.

(102) Over one-half of US polyether polyol exports went to countries in Asia, primarily Japan and Singapore.<sup>92</sup> Central and South America received about one-third of exported US polyether polyols.<sup>93</sup> Mexico accounted for a large share of this third; it received approximately 10%–15% of total US exports.<sup>94</sup> Canada also received approximately 10%–15% of total US polyether polyols exports.<sup>95</sup>

<sup>92</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 1999, at 39.

<sup>93</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 1999, at 39.

<sup>94</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 42.

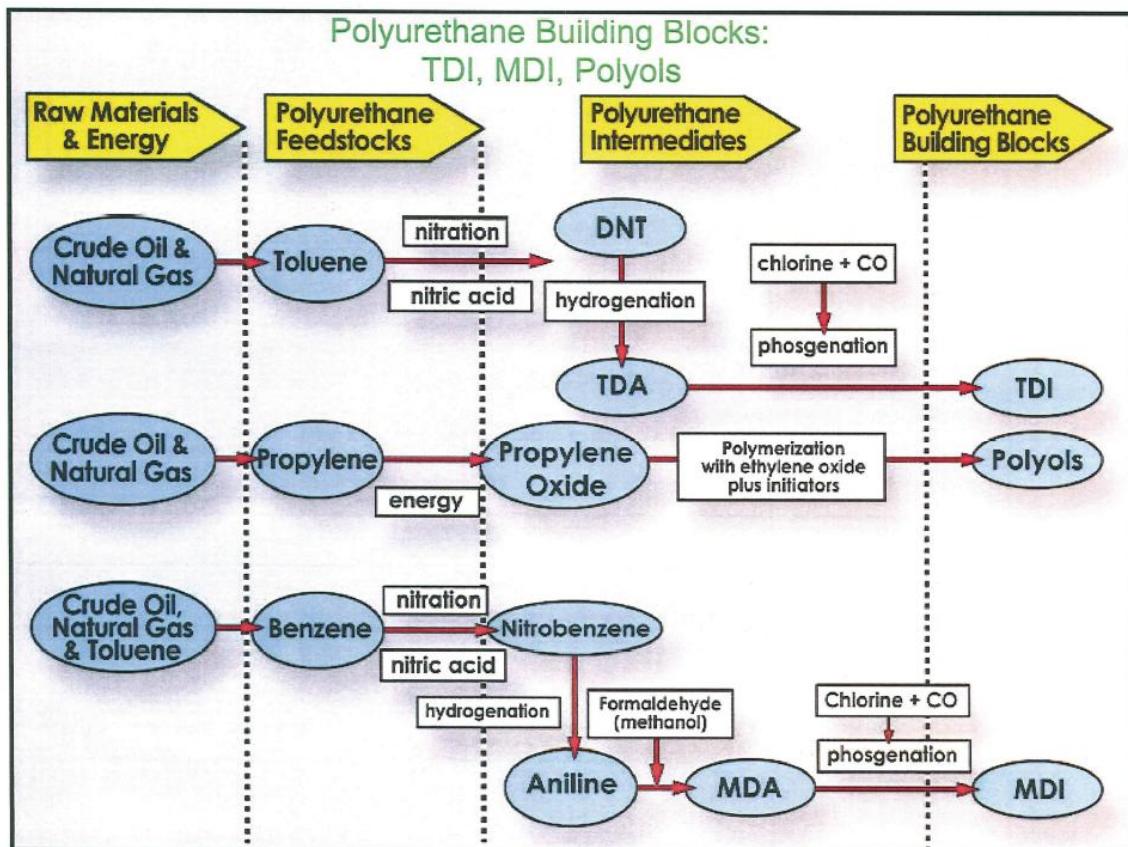
<sup>95</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 42.

## 5.3. Production process overview

(103) Sections 5.3.1, 5.3.2, and 5.3.3 provide an overview of the TDI, MDI, and polyols manufacturing process, respectively.

(104) Toluene, benzene, and propylene are the key feedstocks used to make TDI, MDI, and polyols, respectively, as shown in Figure 22.<sup>96</sup>

**Figure 22 Production process overview**



Source: BASF 2009 MDI Handbook, 4, [http://www2.bASF.us/urethanechemicals/Specialty\\_Systems/pdfs/mdiHandbook.pdf](http://www2.bASF.us/urethanechemicals/Specialty_Systems/pdfs/mdiHandbook.pdf), accessed March 3, 2011.

<sup>96</sup> Benzene is itself derived from toluene. See, e.g., Kenneth Lane, BASF Corporation 30(b)(6) testimony, Nov. 10, 2010, at 25.

### 5.3.1. TDI

- (105) The basic way in which TDI was made was to react toluene diamine (TDA) with phosgene. The primary raw materials used to make TDA and phosgene—and thus needed to make TDI—are toluene, nitric acid, natural gas (used as a source of hydrogen and carbon monoxide), and chlorine.<sup>97, 98</sup>
- (106) The end result of this production process is TDI 80/20.<sup>99</sup> After TDI 80/20 has been produced, the output can be crystallized to extract pure TDI 100.<sup>100</sup> After TDI 100 is removed, the remaining solution is TDI 65/35.<sup>101, 102</sup>
- (107) A significant amount of hydrochloric acid (HCl) is also produced as a by-product during the production of TDI.<sup>103</sup> Suppliers have several options for disposal/use of the HCl by-product. It can be recycled back to chlorine, sold, used as an input for production of other chemicals, or discarded.<sup>104, 105</sup>
- (108) Although Defendants employed the same basic production process to make TDI, they differed somewhat in whether they made or bought the raw materials and the intermediate chemicals. For example, Bayer purchased toluene and produced the DNT intermediate at its Baytown plant, whereas BASF purchased DNT and produced the TDA intermediate at its Geismar plant.<sup>106</sup>

### 5.3.2. MDI

- (109) The basic way in which polymeric MDI was made was to react methylne dianline (MDA) with phosgene. The primary raw materials used to manufacture MDA and phosgene—and

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<sup>97</sup> Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 639, 641.

<sup>98</sup> Natural gas was also used as a source of energy for the TDI production process. See footnote 338.

<sup>99</sup> Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 639.

<sup>100</sup> Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 639.

<sup>101</sup> Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 639.

<sup>102</sup> During the relevant time period, Bayer was the only US producer that performed this final separation. See *infra* ¶ (52).

<sup>103</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 14; Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 643.

<sup>104</sup> Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PUR0293633–715 at 643–44.

<sup>105</sup> Deposition of Steven Hostetter, Jan. 13, 2010, 132.

<sup>106</sup> BCC 0014475-98 at 77; BCPUR0063812-15.

thus needed to manufacture polymeric MDI—are benzene, nitric acid, natural gas (used as a source of hydrogen and carbon monoxide), chlorine, and formaldehyde.<sup>107, 108</sup>

- (110) The ratio of formaldehyde to aniline and/or the rate at which formaldehyde is added during the reaction can be adjusted to alter the characteristics of the final polymeric MDI products.<sup>109</sup>
- (111) As with TDI, a significant amount of hydrochloric acid (HCl) is also produced as a by-product during the production of polymeric MDI.<sup>110</sup>
- (112) As with TDI, Defendants employed the same basic production process to make polymeric MDI, but they differed somewhat in whether they made or bought the raw materials and the intermediate chemicals. For example, Huntsman purchased benzene and produced the aniline intermediate at its Geismar plant, whereas Bayer purchased aniline and produced the MDA intermediate at its Baytown plant.<sup>111</sup>
- (113) Monomeric MDI is made by distilling polymeric MDI.<sup>112</sup> Consequently, it costs more to manufacture, but it uses the same raw material inputs as polymeric MDI.<sup>113</sup>

### 5.3.3. Polyether polyols

- (114) The basic way in which polyether polyols were made was to process propylene oxide and ethylene oxide in a reactor. The primary raw materials for propylene oxide and ethylene

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<sup>107</sup> Tecnon OrbiChem, *MDI World Study 1998–2010*, BASF Corporation US 1128261–352 at 269, 272.

<sup>108</sup> Natural gas was also used as a source of energy for the MDI production process. See footnote 338.

<sup>109</sup> SynUthane International Inc., *Understanding Polyurethanes* (HC000593096-162 at 127).

<sup>110</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 15; Tecnon OrbiChem, *MDI World Study 1998-2010*, BASF Corporation US 1128261–352 at 343.

<sup>111</sup> BCC 0014475-98 at 77; Huntsman International LLC’s Objections and Answers to the Direct Action Plaintiffs’ Second Set of Interrogatories Directed to All Defendants, Exhibit A, Table 3, August 2, 2010.

<sup>112</sup> See, e.g., Deposition of Gregory Geaman, Nov. 12, 2009, 232–33:

Q. All right. Let me ask you about—first of all, is pure another way of describing MDI?

A. It’s a type of MDI.

Q. And is it—is it used by—when somebody asks for—is it a specialty MDI or is it the more universal MDI?

A. What happens when you make MDI is you get this soup of products that come out, and it has all these different oligomers, so there is six sites on a Benzene ring, and if it has two, it’s called pure; if it has three it’s called tri; so a pure M di[-iso]cyanate] would have only two rings in all of the molecules.

So it is a distilled version of the soup, so take out all the higher oligomers of the product mix.

<sup>113</sup> See, e.g., Hankins Dep. 474–75 (“[P]ure MDI and [variants of] MDI are more costly to make [than polymeric MDI]”) and Deposition of Gary Liebbe, June 23, 2010, 79 (“Q. [...] were there different costs that went into the manufacture of pure MDI versus polymeric MDI? A. Minor.”).

oxide are propylene and ethylene, respectively.<sup>114</sup> Other raw materials include various chemical catalysts, initiators, additives, and stabilizers.<sup>115</sup>

- (115) The order of the inputs, speed of the reaction, and length of time in the reactor affect the characteristics of the resulting polyol product.<sup>116</sup> For example, some polyether polyols are “capped” with ethylene oxide to increase the reactivity of the molecule and produce foams with certain characteristics that, otherwise, cannot be achieved by using only propylene oxide.<sup>117</sup>
- (116) The above description of how polyols are made applies to most types of polyols.<sup>118</sup> Copolymers, however, require additional steps. The addition of styrene and/or acrylonitrile to a CFS or HR polyol produces high-molecular-weight polymer “solids” dispersed throughout the polyol, and this turns the mix into a copolymer product.<sup>119</sup>
- (117) As with TDI and MDI, Defendants employed the same basic production process to make polyols, but they differed somewhat in whether they made or bought the raw materials and the intermediate chemicals. For example, Dow produced its own propylene for the manufacture of the propylene oxide intermediate at its Freeport plant, whereas BASF purchased propylene oxide for the production of polyether polyols at its Geismar plant.<sup>120</sup>

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<sup>114</sup> SRI Consulting, “Propylene Oxide,” *CEH Marketing Research Report*, December 1999, at 8-10; SRI Consulting, “Ethylene Oxide,” *CEH Marketing Research Report*, April 1997, at 8-11.

Most propylene oxide was used to make polyether polyols. “[P]olyether polyols are the largest outlet for propylene oxide and have traditionally accounted for 57-60% of total consumption.” SRI Consulting, “Propylene Oxide,” *CEH Marketing Research Report*, December 1999, at 18-19. However, less than 10% of propylene consumed in the US was used to make propylene oxide. SRI Consulting, “Propylene,” *CEH Marketing Research Report*, July 2009, at 69, 72.

<sup>115</sup> Natural gas was used as a source of energy for the polyols production process. See footnote 338.

<sup>116</sup> Huntsman internal document, “Polyurethanes Training Program,” HC006991002-58 at 14-16.

<sup>117</sup> SynUthane International Inc., *Understanding Polyols – 2002 Edition*, HC000756237-357 at 265.

<sup>118</sup> See, e.g., BASF Corporation, *N-KUN 2003 Operational Plan*, BASF Corporation US 493105-436 at 242 (breaking variable manufacturing costs of all polyols but copolymers into propylene oxide, ethylene oxide, and all other).

<sup>119</sup> See, e.g., The Dow Chemical Company, *Flexible Polyurethane Foams*, HC008370328-807 at 352; SynUthane International Inc., *Understanding Polyols – 2002 Edition*, HC000756237-357 at 291; BASF Corporation, *N-KUN 2003 Operational Plan*, BASF Corporation US 493105-436 at 242 (breaking variable manufacturing costs of copolymers into conventional-backbone, styrene, acrylonitrile, and all other).

<sup>120</sup> BASF Corporation US 1105675-6134 at 691; SRI Consulting, “Propylene Oxide,” *CEH Marketing Research Report*, Dec. 1999, at 12; SRI Consulting, “Propylene Oxide,” *CEH Marketing Research Report*, Oct. 2009, at 17.

### 5.3.4. Barriers to entry

(118) It was expensive and time-consuming to build a plant to manufacture TDI, MDI, or polyols. It took approximately 2-3 years to permit and build a TDI or MDI plant, and a year or more for a polyols plant.<sup>121</sup> The cost of building a TDI and MDI plant was in the hundreds of millions of dollars.<sup>122</sup> Polyols plants were less expensive and easier to build.<sup>123</sup> If the design of a new plant also included plans to produce some of the chemicals used in the production process of TDI, MDI, or polyols, the plant would be even more expensive to build.<sup>124</sup>

(119) Standard and Poor's described the polyurethanes business as "characterized by...significant barriers to entry (including technological complexity and long -term customer relationships)." <sup>125</sup>

(120) Defendants also acknowledged the obstacles facing new entrants:

- Huntsman: "We believe it is unlikely that any new major producers of MDI will emerge due to the substantial requirements for entry such as the limited availability of licenses for MDI technology and the substantial capital commitment that is required to develop both the necessary technology and the infrastructure to manufacture and market MDI."<sup>126</sup>
- BASF: "There's a pretty high burden to get into the business. If you look at the economies of scale, you have to build a substantial-sized plant, and with that comes a huge investment. The players today are very strong, so it would be tough for someone who was not in the same area and back-integrated to get into the business."<sup>127</sup>

<sup>121</sup> Bayer Confidential Memorandum, "Answers to Frequently Asked Questions," November 20, 2000 (BC/PUR0555250-56 at 53); Deposition of Peter Huntsman, Feb. 18, 2010, 219-220; Liz White, "BASF plans 100 kt polyols", *Urethanes Technology* 23, no. 2 (April/May 2006): 4.

<sup>122</sup> Deposition of Jean-Pierre Dhanis, June 10-11, 2010, 357-58; Hartwig Dep. 520; Huntsman Dep. 217-220; Karl Greenberg, "MDI Enters a Phase of Rapid Growth," *Chemical Marketing Reporter*, March 6, 2000 (HC006808370-72 at 70-71); Westervelt, Robert, "Dow to Build US TDI Plant; Miles is Still Committed to US Project," *Chemical Week*, February 22, 1995.; "Bayer Selects Baytown for New TDI Plant," *Chemical Market Reporter*, October 22, 1998.; "Jacobs Bags BASF Geismar Polyol Expansion Contract," *Chemical Week*, August 16, 2006.

<sup>123</sup> Liz White, "BASF plans 100 kt polyols", *Urethanes Technology* 23, no. 2 (April/May 2006): 4; BASF Corporation US 4463048-142 at 102.; David Fischer email, "Polyurethanes - An Industry in Transition", January 3, 2001, TDCC PU1595279-85 at 82.

<sup>124</sup> Huntsman Dep. 217-222.

<sup>125</sup> "S&P Cuts Huntsman Intl To BB- From BB," March 1, 2001, TDCC\_PU 184426-28 at 27.

<sup>126</sup> Huntsman Confidential Information Memorandum, HC001593215-467 at 258-59.

<sup>127</sup> Karl Greenberg, "MDI Enters a Phase of Rapid Growth," *Chemical Marketing Reporter*, March 6, 2000 (HC005808370-72 at 70-71).

## 5.4. Suppliers

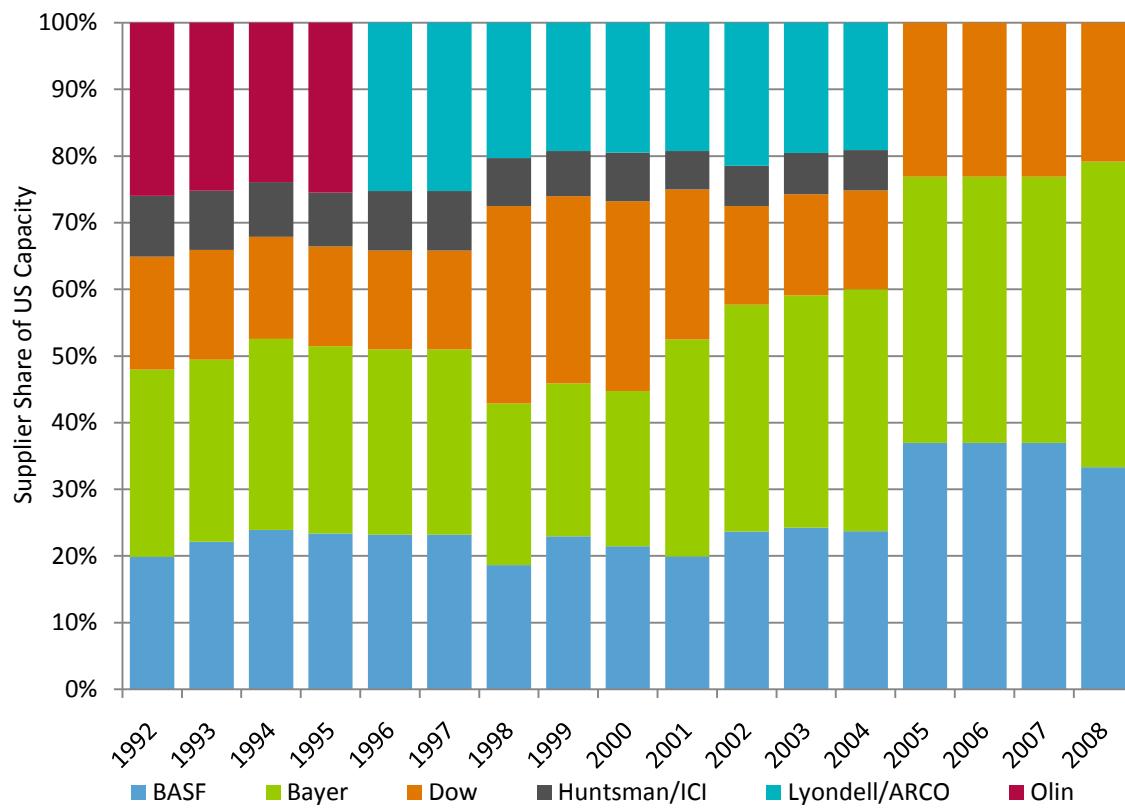
(121) In this section, I summarize information about suppliers of TDI, MDI, and polyether polyols.

### 5.4.1. Market shares

(122) As shown in Figure 23 through Figure 25, BASF, Bayer, Dow, Huntsman, and Lyondell dominated the production and supply of TDI, MDI, and polyether polyols in the United States.

(123) As shown in Figure 23, Defendants controlled 75% of TDI capacity in the United States through 1995, and 100% from 1996 through 2008.

**Figure 23 Supplier share of US capacity, TDI**



Source: Capacity database

(124) Lyondell increased its TDI capacity in 1998 by acquiring ARCO.<sup>128</sup> This acquisition gave Lyondell control of ARCO's TDI capacity in Lake Charles, Louisiana. This facility accounted for 20% of US TDI capacity in 1998.<sup>129</sup> Lyondell subsequently closed the facility in 2005.<sup>130</sup>

(125) Huntsman acquired ICI's global polyurethanes business in 1999 and maintained a majority interest until acquiring full ownership in May 2003.<sup>131</sup> In the United States, this acquisition gave Huntsman control of ICI's capacity in Geismar, Louisiana, and this capacity accounted for 7% of US TDI capacity in 1999.<sup>132</sup> Huntsman sold its TDI customer list and contracts to BASF in 2005 and permanently shut down the TDI plant.<sup>133</sup>

(126) As shown in Figure 24, Defendants controlled 100% of MDI capacity in the United States from 1992 through 2008.

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<sup>128</sup> See *infra* ¶ (151).

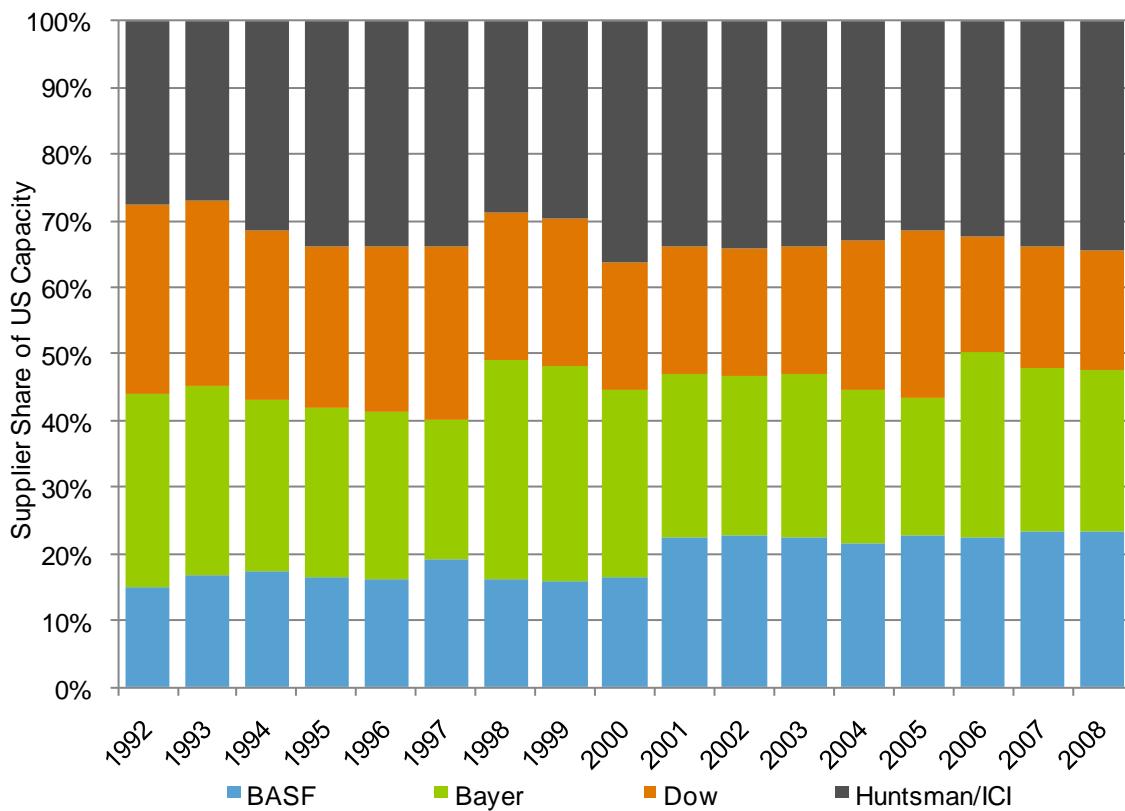
<sup>129</sup> Capacity database.

<sup>130</sup> See *infra* ¶ (184).

<sup>131</sup> See *infra* ¶ (145).

<sup>132</sup> Capacity database.

<sup>133</sup> See *infra* ¶¶ (135), (144), (183).

**Figure 24 Supplier share of US capacity, MDI**

Source: Capacity database

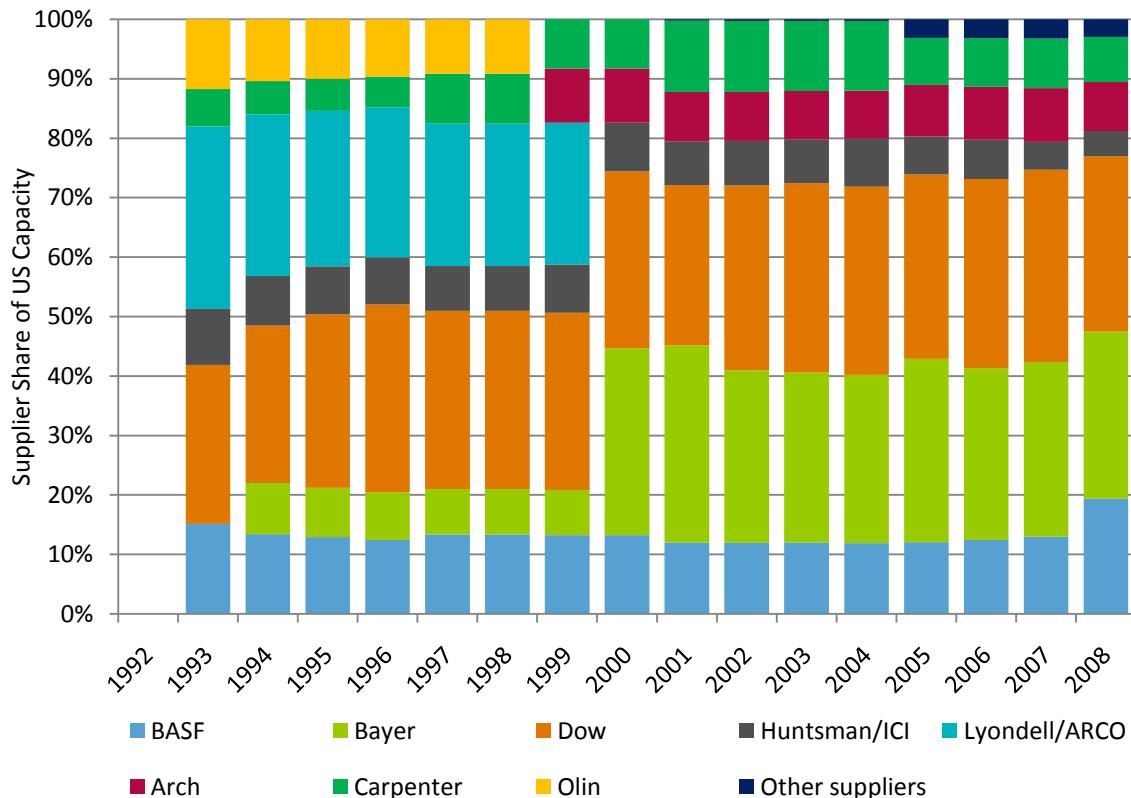
(127) Huntsman's 1999 acquisition of ICI gave it control of ICI's capacity in Geismar, Louisiana.<sup>134</sup> This capacity accounted for 30% of US MDI capacity in 1999.<sup>135</sup>

(128) As shown in Figure 25, Defendants controlled approximately 80% of polyether polyol capacity in the United States from 1992 through 2008. Throughout the conspiracy period, a handful of non-Defendants accounted for the remaining 20% of US capacity.<sup>136</sup> Certain non-Defendant producers, such as Carpenter, manufactured products primarily for internal use.<sup>137</sup>

<sup>134</sup> See *infra* ¶ (145).<sup>135</sup> Capacity database.<sup>136</sup> Capacity database.<sup>137</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 15–18; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 2006, at 18–19.

Over 1992-2008, Carpenter's sales to third party customers accounted for no more than 20% of its total production.<sup>138</sup>

**Figure 25 Supplier share of US capacity, polyether polyols**



Source: Capacity database

(129) In 1998, Lyondell acquired ARCO's polyols business. From 1999 to 2000, Bayer's share of US polyol capacity increased from 8% to 31% through Bayer's acquisition of Lyondell's polyols capacity.<sup>139</sup> Bayer gained control of Lyondell's preexisting capacity in Institute, West Virginia, and South Charleston, West Virginia, as well as capacity Lyondell bought from ARCO in 1998 in Channelview, Texas.<sup>140</sup>

<sup>138</sup> Information provided by Carpenter.

<sup>139</sup> Capacity database; also see *infra* ¶ (151).

<sup>140</sup> Capacity database; also see *infra* ¶ (151).

(130) As stated above, Huntsman's 1999 acquisition of ICI gave it control of ICI's capacity in Geismar, Louisiana.<sup>141</sup> This capacity accounted for 4% of US polyol capacity in 1999.<sup>142</sup>

### 5.4.2. Defendant suppliers

#### 5.4.2.1. BASF

(131) Defendant BASF SE is a German company headquartered in Ludwigshafen, Germany. It acts as the largest operating company in the BASF Group, which describes itself as the world's leading chemical company.<sup>143</sup> Defendant BASF Coordination Center Comm V. is a Belgian company headquartered in Antwerpen, Belgium, and was responsible for developing BASF's global polyurethanes strategy and guiding its regional activities.<sup>144</sup> Defendant BASF Corporation is headquartered in Florham Park, New Jersey, and is described as the North American affiliate of BASF SE.<sup>145</sup> Defendants BASF SE, BASF Coordination Center Comm V., and BASF Corporation are collectively referred to as "BASF."

(132) Figure 26 shows BASF sales within the United States by product.

**Figure 26 BASF's US sales, 1994–2003**

Product	BASF's US sales to direct action plaintiffs (\$ millions)	BASF's US sales to all purchasers (\$ millions)
TDI	\$ 705.2	\$ 1,194.9
MDI	\$ 78.9	\$ 935.2
Polyols	\$ 395.6	\$ 1,207.3

Source: Combined transaction database

<sup>141</sup> See *infra* ¶ (145).

<sup>142</sup> Capacity database.

<sup>143</sup> BASF website: "Organization of the BASF Group," <http://www.bASF.com/group/corporate/en/about-bASF/profile/structure-organization> accessed on April 10, 2011; "BASF at a Glance," <http://www.bASF.com/group/corporate/en/about-bASF/index?mid=0> accessed on April 10, 2011.

<sup>144</sup> Second Amended Woodbridge Complaint, *Woodbridge Foam Corporation, et al. v. BASF SE, et al.*, Civil Action No. 09-2026 (D. Kan.), at 12. See also Kenneth Lane Dep. (BASF Corporation 30(b)(6) testimony), Nov. 10, 2010, at 146–49, 154–55.

<sup>145</sup> BASF Corporation website, "About Us," <http://www2.bASF.us/corporate/aboutbasfindex.html> accessed on April 10, 2011.

- (133) BASF manufactured TDI, MDI, and polyether polyols in Geismar, Louisiana, and polyether polyols in Wyandotte, Michigan.<sup>146</sup>
- (134) BASF manufactured polyether polyol products worldwide at facilities in Mexico, South America, Europe, and Asia.<sup>147</sup> BASF also owned and operated systems facilities in Michigan, California, Texas, South Carolina, and Minnesota.<sup>148</sup>
- (135) In 2005, BASF acquired Huntsman's TDI business, including customer lists and contracts, but not Huntsman's Geismar TDI manufacturing facilities, which were shut down.<sup>149</sup>

#### 5.4.2.2. Dow

- (136) Defendant Dow Chemical Company ("Dow") is an American company headquartered in Midland, Michigan, and describes itself as manufacturing and selling chemicals, plastic materials, agricultural products and services, advanced materials, and other specialized products and services.<sup>150</sup>
- (137) Figure 27 shows Dow sales within the United States by product.

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<sup>146</sup> Defendant BASF Corporation's Responses and Objections to Direct Action Plaintiffs' Second Set of Interrogatories to all Defendants, at 19, Aug. 2, 2010.

<sup>147</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Sept. 1998, at 10; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Feb. 2002, at 11; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Dec. 2005, at 9; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 10, 20; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 1999, at 7; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, July 2002, at 7; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 2006, at 8; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, May 2009, at 9.

<sup>148</sup> Defendant BASF Corporation's Responses and Objections to Direct Action Plaintiffs' Second Set of Interrogatories to all Defendants, at 19, Aug. 2, 2010.

<sup>149</sup> Sonja Franklin and Jack Kaskey, "Chemical-maker BASF to buy Huntsman's TDI business," *Deseret News*, July 7, 2005, <http://www.deseretnews.com/article/print/600146715/Chemical-maker-BASF-to-buy-Huntsmans-TDI-business.html>, accessed on Sept. 13, 2010; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Dec. 2005, at 19.

<sup>150</sup> The Dow Chemical Company, Annual Report (Form 10-K), at 3 (for the year ending Dec. 31, 2009).

**Figure 27 Dow's US sales, 1994–2003**

Product	Dow's US sales to direct action plaintiffs (\$ millions)	Dow's US sales to all purchasers (\$ millions)
TDI	\$ 164.0	\$ 672.0
MDI	\$ 137.0	\$ 1,563.4
Polyols	\$ 509.3	\$ 2,745.2

Source: Combined transaction database

(138) Dow manufactured TDI and MDI in Freeport, Texas, and MDI and polyether polyols in La Porte, Texas.<sup>151</sup> From 1997 to at least 2000, Dow had an exclusive tolling agreement for polyether polyols produced by Huntsman at its Conroe, Texas, facility.<sup>152</sup>

(139) Dow manufactured polyether polyol products worldwide at facilities in Canada, South America, Europe, and Asia.<sup>153</sup> Dow also owned and operated systems facilities in Marietta, Georgia, and Rancho Cucamonga, California.<sup>154</sup> In 2001, Dow acquired EniChem's polyurethanes business, including polyether polyol products plants in Italy at Porto Marghera (Venice), Brindisi, and Priolo (Siracusa, Sicily), and a plant in Tertre, Belgium.<sup>155</sup>

<sup>151</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 20; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 21; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 19; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 20; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 15; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 16; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 18; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 16.

<sup>152</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 15–16; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 16; Email from Bob Watson, “Re[2]: FOAM ENT,” May 16, 2000, HC000148505–522 at 21; Huntsman presentation, “The Americas Rigid Polyol Strategy,” HC000313434–50 at 45.

<sup>153</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 11; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 11; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 9; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 10; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 6; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 7; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 8; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 8.

<sup>154</sup> Defendant The Dow Chemical Company’s First Supplemental Response to Direct Action Plaintiffs’ Second Set of Interrogatories to all Defendants, Exhibit A, Oct. 8, 2010.

<sup>155</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 55–56; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 46–47.

### 5.4.2.3. Huntsman/ICI

(140) Defendant Huntsman International LLC (“Huntsman”) is an American company headquartered in Salt Lake City, Utah, and describes itself as a global manufacturer of differentiated organic and inorganic chemical products.<sup>156</sup>

(141) Figure 28 shows Huntsman sales within the United States by product.

**Figure 28 Huntsman’s US sales, 1994–2003**

Product	Huntsman’s US sales to direct action plaintiffs (\$ millions)	Huntsman’s US sales to all purchasers (\$ millions)
TDI	\$ 191.3	\$ 622.2
MDI	\$ 266.1	\$ 2,654.0
Polyols	\$ 2.7	\$ 104.0

Source: Combined transaction database

(142) Huntsman manufactured TDI, MDI, and polyether polyols in Geismar, Louisiana.<sup>157</sup> From 1994 to at least 2000, Huntsman tolled polyether polyols at Conroe, Texas; exclusively for Eastman Chemical from 1994 to 1997, and exclusively for Dow beginning in 1997.<sup>158</sup>

(143) Huntsman manufactured polyether polyol products worldwide at facilities in Europe, Asia, and Australia.<sup>159</sup>

<sup>156</sup> Huntsman International, Annual Report (Form 10-K), at 1 (for the year ending Dec. 31, 2009).

<sup>157</sup> The Geismar plant is owned and operated by Rubicon Chemical, a joint venture between Huntsman and Chemtura (Huntsman International LLC’s Objections and Answers to the Direct Action Plaintiffs’ Second Set of Interrogatories Directed to All Defendants, at 11, August 2, 2010); SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 21; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 19; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 20; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 16; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 16–17; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 18; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 17.

<sup>158</sup> The original tolling agreement was created in 1987 between Texaco and ARCO Chemical. ARCO sold the rights to Eastman in 1991, and the rights were sold again to Dow in 1997. SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 15–16; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 16.

<sup>159</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 12; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 10; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 10; SRI

- (144) In 1994, Huntsman purchased Texaco Chemical Inc., including its tolling agreement for polyols.<sup>160</sup>
- (145) In 1999, Huntsman acquired a majority interest in the global polyurethanes business of Imperial Chemicals Industries, Ltd. (ICI). It maintained this interest until it acquired full ownership in May 2003.<sup>161</sup> In 1999, Huntsman also acquired the Orica Polyurethanes business and the TPU business of Rohm & Haas.<sup>162</sup>
- (146) In 2005, Huntsman sold its global TDI business to BASF and closed its TDI production facility in Geismar.<sup>163</sup>

#### 5.4.2.4. Lyondell

- (147) Defendant Lyondell Chemical Company (“Lyondell”) was an American company headquartered in Houston, Texas, and described itself as a global manufacturer of chemicals and North American manufacturer of plastics, as well as an oil refiner and producer of gasoline blending components. In 2007, Lyondell became a wholly owned subsidiary of LyondellBasell Industries.<sup>164</sup>
- (148) Figure 29 shows Lyondell sales within the United States by product.

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<sup>160</sup> Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 7.

<sup>161</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 16.

<sup>162</sup> ICI initially retained a 30% stake in the polyurethanes business. Huntsman subsequently acquired the remaining ICI share from an ICI subsidiary on May 9, 2003. See Huntsman, Annual Report (Form 10-K), at 2 (for the year ending Dec. 31, 2003).

<sup>163</sup> Huntsman International News Archive, June 17, 2003, [http://www.huntsman.com/pu/eng/News/News\\_archive/News\\_archive/Huntsman\\_Corporation/index.cfm?PageID=5&News\\_ID=875&style=328](http://www.huntsman.com/pu/eng/News/News_archive/News_archive/Huntsman_Corporation/index.cfm?PageID=5&News_ID=875&style=328), accessed on Aug. 30, 2010.

<sup>164</sup> Sonja Franklin and Jack Kaskey, “Chemical-maker BASF to buy Huntsman’s TDI Business,” *Deseret News*, July 7, 2005. <http://www.deseretnews.com/article/print/600146715/Chemical-maker-BASF-to-buy-Huntsmans-TDI-business.html>, accessed on Sept. 13, 2010; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 19.

<sup>165</sup> Lyondell Chemical Company, Annual Report (Form 10-K), at 1 (for the year ending Dec. 31, 2007).

**Figure 29 Lyondell's US sales, 1994–2003**

Product	Lyondell's US sales to direct action plaintiffs (\$ millions)	Lyondell's US sales to all purchasers (\$ millions) <sup>165</sup>
TDI	\$ 415.6	\$ 887.8
MDI	\$ -	\$ -
Polyols	\$ 925.7	\$ 1,569.2

Source: Combined transaction database

(149) Lyondell manufactured TDI in Lake Charles, Louisiana; and it manufactured polyether polyols in Channelview, Texas; Institute, West Virginia; and South Charleston, West Virginia.<sup>166</sup> In 2002, Lyondell entered an exclusive toll manufacturing agreement with Penn Specialty for polyether polyols manufactured by Penn Specialty in Memphis, Tennessee, with BDO supplied by Lyondell.<sup>167</sup>

(150) Lyondell manufactured polyether polyol products worldwide at facilities in Europe and Asia.<sup>168</sup>

(151) In 1998, Lyondell acquired ARCO Chemical Company and obtained ARCO's polyurethanes business, including its TDI facility in Lake Charles, Louisiana. Lyondell's acquisition included Rhone-Poulenc's TDI business, which had been acquired by ARCO in 1994.<sup>169</sup> In

<sup>165</sup> Lyondell polyol sales to non-Plaintiffs in 1994, 1996, and 1997 are not contained in this figure. See footnote 363.

<sup>166</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Feb. 2002, at 21; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 1999, at 17.

<sup>167</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 2006, at 19; Paint & Coatings Newsletter, Vol.5, No. 65, Aug. 13, 2002, HC013855687-89 at 87.

<sup>168</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Feb. 2002, at 12; SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 1999, at 7.

<sup>169</sup> AW and Natasha Alperowicz, "RP Cedes TDI to Arco; Acetols Still for Sale," *Chemical Week*, Dec. 14, 1994; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Sept. 1998, at 46-48; Lyondell Chemical, Annual Report (Form 10-K), at 4 (for the year ending Dec. 31, 2004). See also SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Feb. 2002, at 22. See also "Lyondell to Suspend Production at Lake Charles TDI Plant," *Chemie.De*, Sept. 22, 2005, <http://www.chemie.de/news/e/49079/?sort=3>, accessed on Aug. 30, 2010.

2000, Lyondell sold its polyols business to Bayer.<sup>170</sup> Lyondell permanently closed its Lake Charles, Louisiana, facility in September 2005.<sup>171</sup>

### 5.4.3. Co-conspirators

#### 5.4.3.1. Bayer

(152) Co-conspirator Bayer AG is a German company headquartered in Leverkusen, Germany, and acts as a holding company for all other companies and divisions within the Bayer Group, which describes itself as a global enterprise with core competencies in the fields of health care, nutrition, and high-tech materials.<sup>172</sup> Co-conspirator Bayer Corporation is headquartered in Pittsburgh, Pennsylvania, and is described as the North American subsidiary of Bayer AG, supporting all Bayer subgroups in North America.<sup>173</sup> Co-conspirator Bayer MaterialScience AG is headquartered in Leverkusen, Germany, and contains Bayer's Polyurethanes Business Unit.<sup>174</sup> Co-conspirator Bayer Material Science LLC is also headquartered in Pittsburgh, Pennsylvania, and is described as the regional headquarters for Bayer MaterialScience.<sup>175</sup> Bayer AG, Bayer Corporation, Bayer MaterialScience AG, and Bayer Material Science LLC are collectively referred to as "Bayer."

(153) Figure 30 shows Bayer sales within the United States by product.

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<sup>170</sup> Lyondell, "Lyondell Reports Conclusion of European Union Review of Polyols Agreement with Bayer; Closing Expected Early in Second Quarter," news release, Feb. 22, 1999, <http://lyondellbasell.mediaroom.com/index.php?s=43&item=137&printable>, accessed on September 13, 2010.

<sup>171</sup> See *infra* ¶ (184).

<sup>172</sup> Bayer website, "Profile and Organization," <http://www.bayer.com/en/profile-and-organization.aspx> accessed on April 14, 2011.

<sup>173</sup> Bayer AG Financial Statements 2009, 43. See also Bayer Corporation website, "About Bayer," <http://www.bayerus.com/about/bayerinus/bayercorp.aspx> accessed on April 14, 2011.

<sup>174</sup> Bayer MaterialScience website: "Polyurethane – the stuff that foams are made of," [http://www.bayermaterialscience.com/internet/global\\_portal\\_cms.nsf/id/PUR\\_EN](http://www.bayermaterialscience.com/internet/global_portal_cms.nsf/id/PUR_EN); Bayer website accessed on April 10, 2011; "Bayer Material Science Profile," <http://www.bayer.com/en/MaterialScience-Profil.aspx> accessed on April 10, 2011.

<sup>175</sup> Bayer MaterialScience website, "From Canada to Mexico," [http://www.bayermaterialscience.com/internet/global\\_portal\\_cms.nsf/id/NAFTAAP\\_\\_EN](http://www.bayermaterialscience.com/internet/global_portal_cms.nsf/id/NAFTAAP__EN) accessed on April 10, 2011.

**Figure 30 Bayer's US sales, 1994–2003**

Product	Bayer's US sales to direct action plaintiffs (\$ millions)	Bayer's US sales to all purchasers (\$ millions)
TDI	\$ 773.6	\$ 1,727.7
MDI	\$ 243.3	\$ 2,852.8
Polyols	\$ 674.0	\$ 1,919.7

Source: Combined transaction database

- (154) Bayer manufactured TDI, MDI, and polyether polyols in Baytown, Texas, and New Martinsville, West Virginia. It manufactured polyether polyols in Channelview, Texas; Institute, West Virginia; and South Charleston, West Virginia.<sup>176</sup>
- (155) Bayer manufactured polyether polyol products worldwide at facilities in Mexico, South America, Europe, and Asia.<sup>177</sup>
- (156) In 2000, Bayer acquired Lyondell's polyols business, which included plants in Channelview, Texas; Institute, West Virginia; and South Charleston, West Virginia.<sup>178</sup>

<sup>176</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 19; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 21; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 19; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 20; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 15; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 15; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 17; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 16.

<sup>177</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 10; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 11; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Dec. 2005, at 9; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 10; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 7; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 7; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 2006, at 8; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, May 2009, at 8.

<sup>178</sup> SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, July 2002, at 15. See also Lyondell, “Lyondell Reports Conclusion of European Union Review of Polyols Agreement with Bayer; Closing Expected Early in Second Quarter,” news release, Feb. 22, 1999, <http://lyondellbasell.mediaroom.com/index.php?s=43&item=137&printable>, accessed on Sept. 13, 2010.

## 5.5. Plaintiff overview

(157) In this section, I summarize information about Plaintiff purchasers. Detailed Plaintiff summaries and instructions from Plaintiffs' counsel are contained in Appendix C.

### 5.5.1. British Vita

(158) The "British Vita" plaintiffs include: Vitafoam Incorporated, headquartered in High Point, North Carolina; Plaintiff Pathway Polymers Inc. (f/k/a Vita Industrial Inc. d/b/a Hyperlast NA and Hyperlast North America, and as successor-in-interest to Synair Corporation), headquartered in Chattanooga, Tennessee; Vitafoam Products Canada Limited, headquartered in Ontario, Canada; and British Vita Unlimited (as successor-in-interest to Crest Foam Industries Incorporated), headquartered in London, England. British Vita primarily used polyether polyol products as raw materials in the manufacture of foam products used in furniture, bedding, automotive, packaging, and medical and industrial applications. Certain British Vita predecessors-in-interest, including Synair Corporation and Crest Foam Industries Incorporated, also purchased polyether polyol products.

(159) Figure 31 shows British Vita's purchases from Defendants by product.

**Figure 31 British Vita's US purchases from Defendants, 1994–2003**

Product	British Vita's US purchases from Defendants (\$ millions)	Percentage of British Vita's total US purchases
TDI	\$ 234.7	44.0%
MDI	\$ 4.5	0.8%
Polyols	\$ 294.8	55.2%

Source: Combined transaction database

### 5.5.2. Carpenter

(160) Plaintiffs Carpenter Co. (f/k/a E. R. Carpenter Company, Incorporated) (Carpenter) is headquartered in Richmond, Virginia. Carpenter specializes in the manufacture of polyurethane foam. It purchased polyether polyol products as raw materials for use in a variety of foam products, including bedding, carpet underlay, flexible foam packaging, furniture, and memory foams. Carpenter also engaged in the purchase of polyether polyol products for other Carpenter companies located in the United States and Canada, such as E.

R. Carpenter, L.P. (f/k/a Carpenter Chemical, L.P.) and Carpenter Canada Co. (f/k/a Carpenter Canada Ltd. and E. R. Carpenter Company of Canada Limited).

(161) Figure 32 shows Carpenter's purchases from Defendants by product.

**Figure 32 Carpenter's US purchases from Defendants, 1994–2003**

Product	Carpenter's US purchases from Defendants (\$ millions)	Percentage of Carpenter's total US purchases
TDI	\$ 761.3	67.2%
MDI	\$ 103.2	9.1%
Polyols	\$ 268.0	23.7%

Source: Combined transaction database

### 5.5.3. Flexible Foam

(162) The "Flexible Foam" plaintiffs include: Flexible Foam Products, Inc., High Standard Pad, Inc., Ohio Decorative Products, Inc., and Universal Urethanes, Inc. (all headquartered in Spencerville, Ohio) and Nu-Foam Products, Inc., headquartered in Chattanooga, Tennessee. The Flexible Foam plaintiffs purchased polyether polyol products as raw materials for use in foam products that they manufactured for use in bedding, flooring, furniture, packaging, and automotive industries.

(163) Figure 33 shows Flexible Foam's purchases from Defendants by product.

**Figure 33 Flexible Foam's US purchases from Defendants, 1994–2003**

Product	Flexible Foam's US purchases from Defendants (\$ millions)	Percentage of Flexible Foam's total US purchases
TDI	\$ 313.1	43.0%
MDI	\$ 22.0	3.0%
Polyols	\$ 393.1	54.0%

Source: Combined transaction database

### 5.5.4. Foam Supplies

(164) Plaintiff Foam Supplies Inc. (Foam Supplies) is headquartered in Earth City, Missouri. Foam Supplies purchased polyether polyol products as raw materials for use in the manufacture of

rigid foam products for applications in the marine, transportation, construction, food service, manufactured housing, packaging, refrigeration, rotational-molding, furniture, track binder, truck body, and door manufacturing industries. Foam Supplies' predecessor-in-interest, National Polyurethane, Inc. (National Polyurethane), also purchased polyether polyol products.

(165) Figure 34 shows Foam Supplies' purchases from Defendants by product.

**Figure 34 Foam Supplies' US purchases from Defendants, 1994–2003**

Product	Foam Supplies' US purchases from Defendants (\$ millions)	Percentage of Foam Supplies' total US purchases
TDI	\$ -	0.0%
MDI	\$ 62.2	86.5%
Polyols	\$ 9.7	13.5%

Source: Combined transaction database

### 5.5.5. Hickory Springs

(166) Plaintiff Hickory Springs Manufacturing Company (Hickory Springs) is headquartered in Hickory, North Carolina. Hickory Springs purchased polyether polyol products as raw materials for use in foam products that it manufactured primarily for applications in the furniture, bedding, RV, flooring and carpet pad, construction, automotive, packaging, medical, marine, and telecommunications industries. Hickory Springs also engaged in the purchase of polyether polyol products for other Hickory Springs companies located in the United States, such as Hickory Springs of California, Inc.; Carpet Cushion Company, Inc.; and Eastern Foam Products, Inc.

(167) Figure 35 shows Hickory Springs' purchases from Defendants by product.

**Figure 35 Hickory Springs' US purchases from Defendants, 1994–2003**

Product	Hickory Springs' US purchases from Defendants (\$ millions)	Percentage of Hickory Springs' total US purchases
TDI	\$ 326.5	44.8%
MDI	\$ 8.3	1.1%
Polyols	\$ 393.2	54.0%

Source: Combined transaction database

### 5.5.6. Huber

(168) The “Huber” plaintiffs include: J.M. Huber Corporation, headquartered in Edison, New Jersey, and Huber Engineered Woods LLC, headquartered in Charlotte, North Carolina. Huber purchased polyether polyol products primarily for use in residential and commercial construction and industrial applications, such as manufactured board and insulation materials.

(169) Figure 36 shows Huber’s purchases from Defendants by product.

**Figure 36 Huber's US purchases from Defendants, 1994–2003**

Product	Huber's US purchases from Defendants (\$ millions)	Percentage of Huber's total US purchases
TDI	\$ -	0.0%
MDI	\$ 241.4	99.5%
Polyols	\$ 1.1	0.5%

Source: Combined transaction database

### 5.5.7. Leggett & Platt

(170) Plaintiff Leggett & Platt, Incorporated (Leggett & Platt) is headquartered in Carthage, Missouri. Leggett & Platt purchased polyether polyol products as raw materials for use in foam products it manufactured for use in furniture, bedding, foam fabrication, and carpet underlay. Certain Leggett & Platt predecessors-in-interest and subsidiaries purchased polyether polyol products. Such subsidiaries include Leggett & Platt Components Company, Inc.; L&P Financial Services Co.; Crest-Foam Corp.; and Leaving Taos, Inc. Such predecessors-in-interest include Crest-Hood Foam Company, Inc.; Crest-Foam Corp.; Leggett Partners, L.P.; GFC Dura Bond LLC; Met Displays, Inc.; No-Sag Foam Products Company; Royal Store Fixtures Corp.; The Fairmont Corporation; L&P Products Company, Inc.; Southwest Carpet Pad, Inc.; and Iredell Fiber, Inc.

(171) Figure 37 shows Leggett & Platt's purchases from Defendants by product.

**Figure 37 Leggett & Platt's US purchases from Defendants, 1994–2003**

Product	Leggett & Platt's US purchases from Defendants (\$ millions)	Percentage of Leggett & Platt's total US purchases
TDI	\$ 220.1	38.2%
MDI	\$ 55.5	9.6%
Polyols	\$ 301.4	52.2%

Source: Combined transaction database

### 5.5.8. Lubrizol

(172) Plaintiff Lubrizol Advanced Materials, Inc. (f/k/a Noveon, Inc., which was formerly PMD Group Inc. and BFGoodrich Performance Materials, a business unit of B.F. Goodrich Company) (Lubrizol) is headquartered in Cleveland, Ohio. Lubrizol and its predecessors-in-interest purchased polyether polyol products as raw materials for use in products it manufactured for use in a variety of industries and applications, including pharmaceuticals, plastics technology and performance coatings.

(173) Figure 38 shows Lubrizol purchases from Defendants by product.

**Figure 38 Lubrizol's US purchases from Defendants, 1994–2003**

Product	Lubrizol's US purchases from Defendants (\$ millions)	Percentage of Lubrizol's total US purchases
TDI	\$ -	0.0%
MDI	\$ 89.9	100.0%
Polyols	\$ -	0.0%

Source: Combined transaction database

### 5.5.9. MarChem

(174) The “MarChem” plaintiffs include: MarChem Corporation, headquartered in Maryland Heights, Missouri; MarChem Southeast, Inc., headquartered in Adairsville, Georgia; and MarChem Pacific, Inc., headquartered in Orange, California. MarChem purchased polyether polyol products as raw materials for use in products it manufactured for use in a variety of industries, including the automotive, building and construction, filtration, and boating industries.

(175) Figure 39 shows MarChem's purchases from Defendants by product.

**Figure 39 MarChem's US purchases from Defendants, 1994–2003**

Product	Marchem's US purchases from Defendants (\$ millions)	Percentage of Marchem's total US purchases
TDI	\$ 1.0	0.8%
MDI	\$ 76.8	57.8%
Polyols	\$ 55.1	41.4%

Source: Combined transaction database

### 5.5.10. Skypark

(176) Plaintiff Skypark Manufacturing, LLC (Skypark) was originally organized under the laws of California. Skypark is not currently in operation and has assigned its rights to claims in this litigation to Jorge Burtin. Skypark's predecessors-in-interest, Burtin Urethane Corporation and Burtin Polyurethane, LLC (collectively "Burtin"), purchased polyether polyol products as raw materials for use in products it manufactured for use in a variety of industries, including the automotive, prosthetics, truckbed lining, recreational sporting balls, building, roofing and construction, filters, heaters, and boating industries.

(177) Figure 40 shows Skypark's purchases from Defendants by product.

**Figure 40 Skypark's US purchases from Defendants, 1994–2003**

Product	Skypark's US purchases from Defendants (\$ millions)	Percentage of Skypark's total US purchases
TDI	\$ 0.0	0.0%
MDI	\$ 40.4	57.0%
Polyols	\$ 30.6	43.0%

Source: Combined transaction database

### 5.5.11. Woodbridge

(178) The "Woodbridge" plaintiffs include: Woodbridge Foam Corporation, headquartered in Mississauga, Ontario, Canada; Woodbridge Services Inc., headquartered in St. Michael, Barbados; and Woodbridge Holdings Inc., headquartered in Troy, Michigan. Woodbridge purchased polyether polyol products as raw materials for use in its products sold for

applications, including automotive, commercial and recreational transportation, furniture, bedding, building and construction, packaging, insulation, and consumer goods industries. Woodbridge also purchased polyether polyol products for other Woodbridge companies located in the United States, such as Woodbridge Corporation, Woodbridge Foam Fabricating, Inc., Cartex Corporation, Dynaflex Corporation, and SW Foam LLC, as well as for an unrelated United States company, Johnson Controls Inc.

(179) Figure 41 shows Woodbridge's purchases from Defendants by product.

**Figure 41 Woodbridge's US purchases from Defendants, 1994–2003**

Product	Woodbridge's US purchases from Defendants (\$ millions)	Percentage of Woodbridge's total US purchases
TDI	\$ 393.0	33.5%
MDI	\$ 21.0	1.8%
Polyols	\$ 760.2	64.7%

Source: Combined transaction database

## 5.6. Changes in the industry over time

(180) Economic theory teaches that the structure and organization of an industry affect the relationship between prices and demand and supply variables and that they also affect the ability of a conspiracy to elevate prices. Throughout 1992–2008, the polyether polyol products' industry was highly concentrated and dominated at all times by Defendants. As noted above, there were no major changes in the basic production technologies. The basic demand drivers generally grew steadily from 1992 through the 2003–2005 timeframe and then generally declined through 2008.

(181) In this section, I describe two developments that appear to have had important structural ramifications for the industry. First, in 2005, Huntsman and Lyondell closed their TDI plants and exited the TDI business. This reduced the number of TDI suppliers from five to three and eliminated 34% of US TDI capacity. Second, also in 2005, Hurricanes Katrina and Rita caused significant disruption in costs, supply, and transportation. I discuss these changes in sections 5.6.1 and 5.6.2, respectively.

### 5.6.1. TDI plant closures in 2005

- (182) In May 2005, Bayer announced it would close its New Martinsville, West Virginia, TDI plant.<sup>179</sup> The New Martinsville plant accounted for 9% of US TDI capacity.
- (183) In July 2005, BASF purchased Huntsman's TDI business. Huntsman sold its TDI customer lists and sales contracts to BASF<sup>180</sup> and agreed to close its TDI facility in Geismar, LA.<sup>181</sup> The Geismar plant accounted for 6% of US TDI capacity and all of Huntsman's global TDI capacity.
- (184) In September 2005, Lyondell announced it was permanently closing its Lake Charles, Louisiana, plant and exiting the US TDI business.<sup>182</sup> The Lake Charles plant accounted for 19% of US TDI capacity.
- (185) In sum, during the first nine months of 2005, the exit of Huntsman and Lyondell left all US TDI capacity under the control of three Defendants: Bayer, BASF, and Dow. The closure of three facilities in 2005 eliminated 34% of US TDI production capacity, as shown in Figure 42.

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<sup>179</sup> Bayer, "Bayer MaterialScience Closes TDI Facility at New Martinsville," news release, May 24, 2005, [http://www.investor.bayer.com/user\\_upload/1546/](http://www.investor.bayer.com/user_upload/1546/), accessed April 10, 2011.

<sup>180</sup> See Huntsman, "Huntsman sells TDI business to BASF," news release July 6, 2005, [http://www.huntsman.com/pu/eng/News/News/Huntsman\\_sells\\_TDI\\_business\\_to\\_BASF/index.cfm?PageID=4&News\\_ID=1352&style=264](http://www.huntsman.com/pu/eng/News/News/Huntsman_sells_TDI_business_to_BASF/index.cfm?PageID=4&News_ID=1352&style=264), accessed April 10, 2011.

<sup>181</sup> "On July 6, 2005, we sold our toluene di-isocyanate ("TDI") business. The sale involved the transfer of our TDI customer list and sales contracts. We further agreed to discontinue the use of our remaining TDI assets." Huntsman, Annual Report (Form 10-K), at F-47 (for the year ending December 31, 2005).

<sup>182</sup> "Lyondell Chemical Company (NYSE: LYO) announced today [October 19, 2005] that it will permanently cease toluene diisocyanate (TDI) production at its Lake Charles, La., plant. On September 20, 2005, Lyondell announced an indefinite suspension of production at the 300 million pound per year TDI facility while the company evaluated the long-term prospects for the plant. 'Based on our evaluation of future plant capital requirements, high energy and raw materials costs and poor projected industry utilization, we do not expect the Lake Charles TDI business will return to profitability,' said Ed Dineen, senior vice president, Chemicals and Polymers. 'Hurricane Rita contributed to the decision, as it damaged the plant and contributed to increased energy costs.'" Lyondell, "Lyondell to Permanently Cease TDI Production at Lake Charles Plant," news release, Oct. 19, 2005, <http://lyondellbasell.mediaroom.com/index.php?s=43&item=165>, accessed April 10, 2011.

**Figure 42 US TDI plant closures in 2005**

Defendant	Plant	Closure date	Percentage of US TDI Capacity Shut Down
Bayer	New Martinsville, WV	May 2005	9%
Huntsman	Geismar, LA	August 2005	6%
Lyondell	Lake Charles, TX	September 2005	19%
<b>Total</b>			<b>34%</b>

Source: Capacity database

(186) Recognizing the potential antitrust concerns in a more concentrated industry, in January 2006 the American Plastics Council discontinued reporting aggregate TDI production.<sup>183</sup>

(187) Defendants recognized that the capacity reduction and exits amounted to, in the words of Pat Dawson, Dow's vice president of Dow polyurethanes and thermoset systems, "a fundamental change in the market."<sup>184</sup> On October 17, 2005, Dawson noted that "[i]ndustry consolidation is underway for TDI, per recent announcements by Bayer, Huntsman, and Lyondell, and this has contributed to a dramatic shortage of TDI."<sup>185</sup> Similarly, BASF's 30(b)(6) representative testified that the 2005 plant closures represented a "significant change in the supply and demand for the North American market."<sup>186</sup>

(188) Defendants' internal documents reveal their belief that consolidation would increase their profits by leading to higher prices.

- In fall 2004, BASF Corporation believed the TDI business needed to change. A series of internal presentations stated that BASF needed to "Restructure" and "Proactively Reshape" the TDI business in North and South America.<sup>187</sup> BASF noted its actions "would most likely

<sup>183</sup> See BASF Corporation US 2731252, TDCC\_PU240777-805 at 792, APC Monthly Statistical Report, December 2005 (PUWG-00000906), and APC Monthly Statistical Report, January 2006 (PUWG-00000918).

<sup>184</sup> Sim, Peck Hwee, "TDI Shortage Prompts Record Price Increases," *Chemical Week*, October 26, 2006 (TDCC\_PU393796).

<sup>185</sup> The Dow Chemical Company, "Polyurethanes Faces Cost Pressure from Energy and Raw Materials Prices," news release, Oct. 17, 2005, TDCC\_PU392971-77 at 76.

<sup>186</sup> Kenneth Lane Dep. (BASF Corporation 30(b)(6) testimony), Nov. 10, 2010, at 67.

<sup>187</sup> See BASF Corporation US 169040-60 (July 21, 2004); BCC 0441091-1122 (October 4, 2004); BASF Corporation US 1391381-442 (Oct. 5, 2004).

result in a restructuring of the TDI assets in the Americas" and that this would "result in a return to better financial results after the restructuring occurs."<sup>188</sup>

- Bayer likewise indicated in 2004 that "[p]ricing power [is] based on supply - demand" and that Bayer should "[r]ationalize global TDI capacity to match demand".<sup>189</sup>
- BASF Coordination Center noted BASF Corporation's objectives should include the following: "[g]ive attractive offer to Huntsman to consider shutdown plant in US" and "[h]ave regular contacts to Lyondell for shutdown plant in US."<sup>190</sup> BASF Corporation also noted that Bayer might shut down its West Virginia plant.<sup>191</sup>
- After Bayer and Huntsman had announced their shutdowns, Dow's Pat Dawson indicated that additional closures were needed before prices would rise. Dawson noted that "I do not believe [the shutdowns by Bayer and Huntsman] will impact margins simply because operating rates in NAA will only improve from the mid 60's to the mid 70's. . . . we need another 130KT of capacity to come out of NAA before we get close to being balanced. The next likely candidate to shut down would be Lyondell."<sup>192, 193</sup>
- After Lyondell announced its shutdown, BASF's CASE Business Manager was asked "is this enough to change the TDI market place?" He replied, "YES it is (finally). This will tighten up the TDI in North America to what we hope is a reasonable level so that the remaining producers can see a brighter future."<sup>194</sup>

(189) The effects of these closures on the industry were magnified by Hurricanes Katrina and Rita, discussed below.

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<sup>188</sup> BASF Corporation US 169040–60 at 40 (July 21, 2004); BCC 0441091–1122 at 102 (October 4, 2004); BASF Corporation US 1391381–442 at 381 (Oct. 5, 2004).

<sup>189</sup> BCPUR0598933–99054 at 98938 (May, 2004).

<sup>190</sup> BCC 0161485–529 at 491 (Aug. 9, 2004).

<sup>191</sup> BASF Corporation US 169040–60 at 59 (July 21, 2004); BASF Corporation US 1391381–442 at 392 (Oct. 5, 2004).

<sup>192</sup> TDCC\_PU1422747–48 at 47 (July 6, 2005).

<sup>193</sup> Dow believed Lyondell had 129KT of TDI capacity in Lake Charles, Texas. See, e.g., TDCC\_PU0443918–26 at 18.

<sup>194</sup> He added, "[h]owever, a cautionary note - globally TDI is still only at about 85% capacity utilization so frankly we expect that some product will be imported into the US. None the less we should see some price increases stick. This is a financial must for BASF KUN." BASF Corporation US 3115616–17 at 16 (July 21, 2005).

### 5.6.2. Hurricanes Katrina and Rita

- (190) Two major hurricanes impacted polyether polyol products' business conditions in the second half of 2005. Hurricane Katrina struck the Gulf Coast on August 29, 2005. Hurricane Rita followed, striking the Gulf Coast on September 23, 2005.
- (191) These hurricanes decreased the production of oil and natural gas along the Gulf Coast and caused the prices of these commodities to increase.<sup>195</sup> Toluene, benzene, and propylene prices rose at the same time<sup>196</sup> because these items are derived from oil and natural gas.<sup>197</sup>
- (192) The hurricanes disrupted production at some facilities.<sup>198</sup> Some customers were put on sales allocation.<sup>199</sup> A Bayer vice president noted "This may not be a 'perfect storm,' but I have never seen such a collection of problems at one time...this is the first time in 45 years there has been such a storm."<sup>200</sup> Bayer declared *force majeure* on TDI, allocating customers only half of their typical orders.<sup>201</sup> BASF also declared *force majeure* on TDI.<sup>202</sup> Bayer and Dow declared *force majeure* on MDI.<sup>203</sup> Dow and Lyondell declared *force majeure* on propylene oxide (the intermediate chemical between propylene and polyols), and Dow and BASF declared *force majeure* on polyols.<sup>204</sup>

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<sup>195</sup> See, e.g., The Dow Chemical Company, "Polyurethanes Faces Cost Pressure from Energy and Raw Materials Prices," news release, Oct. 17, 2005, TDCC\_PU392971-77 at 74.

<sup>196</sup> See Figure 45, Figure 46, and Figure 47 below, respectively.

<sup>197</sup> See Figure 22 above.

<sup>198</sup> See e.g., Huntsman International LLC's Objections and Answers to the Direct Action Plaintiffs' Second Set of Interrogatories Directed to All Defendants, at 40, August 2, 2010; see also e.g., Defendant The Dow Chemical Company's Response to Direct Action Plaintiffs' Second Set of Interrogatories to All Defendants, at 29–30, August 2, 2010.

<sup>199</sup> See, e.g., Gregory Geaman Dep. (Huntsman International 30(b)(6) testimony), Nov. 30, 2010, at 180–82; Huntsman International LLC's Objections and Answers to the Direct Action Plaintiffs' Second Set of Interrogatories Directed to All Defendants, at 44–45, August 2, 2010.

<sup>200</sup> Bob Kirk, vice president of the comfort marketing unit of Bayer Material Science LLC, quoted in David Reed, "PU's 'perfect storm'?", *Urethanes Technology* 22, no. 6 (Dec. 2005/Jan. 2006): 6.

<sup>201</sup> BASF Corporation US 0702329–42 at 31 (Sept. 28, 2005, ICIS Price Report); BASF Corporation US 3332937; BASF Corporation US 2886765; TDCC\_PU393796 (Oct. 26, 2006, *Chemical Week* article).

<sup>202</sup> Lane Dep. Ex. 7062 (Nov. 16, 2005, *Chemical Week* article).

<sup>203</sup> TDCC\_PU393796 (Oct. 26, 2005, *Chemical Week* article); BASF Corporation US 0702329–42 at 32 (Sept. 28, 2005, ICIS Price Report); BASF Corporation US 046838–45 at 41 (Nov. 16, 2005, ICIS Price Report).

<sup>204</sup> BASF Corporation US 0778686–93 at 87 and 92 (Oct. 24, 2005, Tecnon OrbiChem *Urethane Chemicals* newsletter); TDCC\_PU393796 (Oct. 26, 2005, *Chemical Week* article); BASF Corporation US 046838–45 at 41 (Nov. 16, 2005, ICIS Price Report); Lane Dep. Ex. 7062 (Nov. 16, 2005, *Chemical Week* article).

(193) As Pat Dawson, Dow's vice president of Dow Polyurethanes and Thermoset Systems, noted in an October 17, 2005, news release, nearly a month after Hurricane Rita hit, the situation was not back to normal: "Logistical and transportation issues resulting from flooding and damage to transportation infrastructure in the U.S [sic] Gulf Coast may continue restricting inbound and outbound material flow. This is compounding an already challenging business environment and leading to shortages of PU products."<sup>205</sup> Moreover, the hurricanes led to "a tightening of PO availability, related to strong demand and compounded by the fact that about 34 percent of the US propylene production was shut down due to the recent hurricanes."<sup>206</sup> Dow further noted that "[s]upply remains tight for the raw materials needed to produce MDI/PMDI and polyols," while "supply remains very tight for the raw materials needed to produce TDI."<sup>207</sup>

(194) The effects of the hurricanes appear to have persisted into early 2006.

- Dawson testified that, after the hurricanes, "[t]he market became pretty much sold out overnight, and that had an impact on TDI pricing and TDI margins . . . the incidence of the hurricanes impacted the [TDI] market probably for about four to six months."<sup>208</sup> Dawson testified that MDI and polyols were also impacted by the hurricanes.<sup>209</sup>
- Huntsman International "believes that the impact of Hurricanes Katrina and Rita was felt primarily in the fourth quarter of 2005 and that by the end of March 2006 the supply and demand imbalances created by Katrina and Rita had been largely resolved and the impact of the storms had largely dissipated."<sup>210</sup>
- Peter Huntsman, Huntsman International's CEO, testified that the impact of Hurricanes Katrina and Rita on pricing, sales, and supply for TDI, MDI, and polyols likely lasted three to six months.<sup>211</sup>

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<sup>205</sup> The Dow Chemical Company, "Polyurethanes Faces Cost Pressure from Energy and Raw Materials Prices," news release, Oct. 17, 2005, TDCC\_PU392971-77 at 75.

<sup>206</sup> The Dow Chemical Company, "Polyurethanes Faces Cost Pressure from Energy and Raw Materials Prices," news release, Oct. 17, 2005, TDCC\_PU392971-77 at 75.

<sup>207</sup> The Dow Chemical Company, "Polyurethanes Faces Cost Pressure from Energy and Raw Materials Prices," news release, Oct. 17, 2005, TDCC\_PU392971-77 at 76.

<sup>208</sup> Deposition of Patrick Dawson, March 9, 2010, 162.

<sup>209</sup> Dawson Dep. 162-64.

<sup>210</sup> Huntsman International LLC's Objections and Answers to the Direct Action Plaintiffs' Second Set of Interrogatories Directed to All Defendants, at 43, Aug. 2, 2010.

<sup>211</sup> See Peter Huntsman Dep. 210-11:

Q. Do you have any specific recollection as to how long the Katrina and Rita storms had that impact on the pricing of MDI, TDIs and polyols produced by your company?

## 5.7. Evidence that prices were influenced by collusive conduct during 1994 through 1998

(195) For purposes of estimating damages for the class period, 1999 through 2003, I considered whether it was appropriate to include data from 1994 through 1998 in the benchmark period. I directed my staff to compile information and evidence, favorable and unfavorable, regarding the existence of a potential conspiracy during this period that could have affected prices of polyether polyol products. This is important because the use of data from a time period when a conspiracy was in effect can cause a model to underestimate the impact of the conspiracy on price.<sup>212</sup> This section summarizes the information and evidence which formed the basis for my conclusion that it is not appropriate to include data from 1994 through 1998 in the benchmark period.

### 5.7.1. The structure of the polyether polyol product markets was conducive to collusion

(196) During 1994 through 1998 (as in other times), the structure of the polyether polyol product markets was conducive to successful collusion.<sup>213</sup> The markets were highly concentrated. In the US, Defendants controlled 75 to 100% of TDI capacity, 100% of MDI capacity, and approximately 80% of polyols capacity. There were high barriers to entry. The majority of products were homogeneous. There were frequent transactions and generally observable price adjustments. Defendants had abundant opportunities to communicate with one another, and did so regularly. In many cases, sales contracts had devices that would tend to increase prices above competitive levels, such as most favored nations clauses.

(197) Defendants regularly shared important statistical information regarding their nameplate capacity and market share through trade journals and trade associations.<sup>214</sup> High-ranking

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A. You would have seen the -- the supply disruption and the impact on pricing as it relates to the hurricanes probably it would have occurred for the next three to six months.

[. . .]

Q. Would that be the same amount of time for the sales and supply of MDI, TDI and polyols?

A. I would think so.

<sup>212</sup> See *infra* ¶ (235).

<sup>213</sup> Richard Posner, *Antitrust Law*, 2<sup>nd</sup> ed. (University of Chicago Press, 2001): 69-79.

<sup>214</sup> See, e.g., Lawrence Dep. 79-80 (explaining that document which identified global TDI capacity for 1985 through 1992 came from the chemical marketing journals), at 85-86 (stating that a trade association collected and published annually historical market share and capacity information for TDI and MDI). Some of Defendants' witnesses have observed that the trade associations did not publish individual transactions or actual production. See Lawrence Dep. 87-88 (testifying that trade associations collected capacity, not actual production). But Defendants could still

executives at BASF and Dow testified that they used statistical information obtained through trade associations and trade journals in strategic planning for pricing and volume.<sup>215</sup>

(198) Defendants also shared sensitive business information with each other in the course of negotiating co-producer arrangements and other mutual business ventures. For example, in the context of swaps and plant shutdowns, of which there were many in the urethanes industry, a manufacturer had to inform its competitor how long its production would be down, and how many pounds it would need.<sup>216</sup> In addition, certain manufacturers, like Dow and Bayer, preferred to structure swaps as buy/sell agreements, rather than straight volume-for-volume swaps, which by necessity required pricing to be discussed in that context.<sup>217</sup>

(199) The trade press provided defendants with a vehicle for sharing information about pricing. For example, on March 16, 1995, Reinhard Clausius (Bayer's global strategic marketing director<sup>218</sup>) reported to *Urethanes Technology* that MDI prices would jump 40-50% and TDI

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accurately estimate one another's actual sales based on the available information in the urethanes industry. See, e.g., Exs. 1925, 5580 (Dow spreadsheets titled "Estimated N. American Sales" that identify production of each Defendant for TDI, MDI, Polyether Polyols, and Systems).

<sup>215</sup> Deposition of William Long, November 5, 2010, 105–06 (stating that Dow used the statistical information that it received from the Triple I to get a sense of how fast the market was growing, and when and where it should add new capacity); Lawrence Dep. 52–53 (stating that BASF could forecast price increases into its annual budget because it could so closely identify the supply & demand balance from published data in the urethanes industry).

<sup>216</sup> Long Dep. 238 ("[T]here were discussions when we talked about plant shutdowns and swaps. I mean, you had to discuss a little bit about how long you were going to be down, how many pounds, how many -- so in the context of a swap, some of this may have been discussed, but only in the context of -- of completing a successful swap.").

<sup>217</sup> Richard Mericle testified that BASF preferred a straight volume-for-volume swap, rather than a buy/sell arrangement, because the latter would "get into the issue of pricing and exchange of funds, so to speak," which "might look as if you were trying to get at market pricing." Deposition of Richard Mericle, October 26, 2010, 84–85. Yet, some of its competitors, namely Bayer, preferred a buy/sell arrangement; therefore, some discussion of pricing was sometimes unavoidable. Mericle Dep. 85–87. See also Ex. 5933 (1997 BASF memorandum from Streu states that Churet of Dow indicated that if Dow was to supply TDI to BASF in a time swap, it would be by "purchase only," i.e., a market-price-minus method, which Mericle acknowledged could look like the competitors were trying to get at market pricing).

<sup>218</sup> Throughout this section, I note certain individuals' positions during the pre-class period. Support for these positions can be found among the following documents:

- BAG/PUR-0000066 – BAG/PUR-0000181 (Bayer AG Organization Plans for 1992-1998);
- BC/PUR-000010 – BC/PUR-000129 (Miles Inc. and Bayer Corp. Organization Plans for 1994-1998);
- Ex. 7000 (Summary of BASF Organization prepared by Plaintiffs for BASF's Rule 30(b)(6) Deposition); Lane Dep. 32 (BASF 30(b)(6) witness confirming the accuracy of the information in Ex. 7000).
- Ex. 7502 (Summary of Dow organization prepared by Plaintiffs for Dow's Rule 30(b)(6) Deposition); Deposition of Thomas Feige, Jr., December 1-2, 2010, at 23 (Dow 30(b)(6) witness confirming the accuracy of the information in Ex. 7502).
- Ex. 7085 (Summary of ICI/Huntsman organization prepared by Plaintiffs for Huntsman's Rule 30(b)(6) Deposition); Gregory Geaman Dep., Nov. 30, 2010, at 335-46 (Huntsman 30(b)(6) witness confirming the accuracy of the information in Ex. 7085, with minor exceptions not relevant here).

prices would climb by 25-30% over present levels by year end.<sup>219</sup> In this same trade journal article, Reinhard Leppkes (BASF's head of polyurethanes in Europe) said that companies that "shop around" would "find it hard to get material."<sup>220</sup> Dow, EniChem, ICI and ARCO also made statements regarding supply imbalances (favoring the suppliers) for MDI, TDI, and polyols.<sup>221</sup> The suppliers announced four separate rounds of price increases for urethanes products between April 1, 1995 and January 1, 1996.

(200) Defendants also sent their price increase announcement letters to one another. For example, Bob Lawrence of BASF testified that BASF received a competitor's price increase announcement if it was buying that particular product from the competitor, and vice versa (which was often the case).<sup>222</sup> In addition, Lawrence testified that he directed all sales people at BASF to collect whatever documentation they could on its competitors' pricing, including price increase announcements from competitors.<sup>223</sup> John Phelps, who was responsible for flexible foam in NAFTA for Bayer during the pre-class period, similarly testified that Bayer "took a strong leadership position in raising prices," meaning they "basically [told] the customers take it or leave it," and that if a competitor announced a price increase it was very unusual that Bayer would not increase as well,<sup>224</sup> indicating that Bayer usually had contemporaneous knowledge of its competitors' price increases.

### **5.7.2. High-level executives met and communicated with one another to coordinate prices in the United States and in Europe**

(201) The information available to me indicates that defendants' high-level executives in Europe and North America, with responsibility for the marketing and sale of polyether polyol products, frequently met and communicated with one another. As described below, the information demonstrates that defendants' executives participated in meetings and communications during 1994 to 1998 (and, in many cases, during 1999 to 2003) that involved the discussion and coordination of urethanes prices charged to customers and the restriction of capacity.<sup>225</sup>

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<sup>219</sup> Ex. 4368.

<sup>220</sup> Ex. 4368.

<sup>221</sup> Ex. 4368.

<sup>222</sup> Lawrence Dep. 111-12; Ex. 5673.

<sup>223</sup> Lawrence Dep. 156-57; Ex. 5677.

<sup>224</sup> Phelps Dep. 132-134, 199-200.

<sup>225</sup> I examined evidence in the record in this case, including deposition testimony and documents, as well as publicly available information. In addition, as set forth below, I interviewed counsel for Bayer. In addressing this question

(202) I interviewed outside counsel for Bayer, who conducted an internal investigation of Bayer's involvement in the alleged conspiracy.<sup>226</sup> Bayer's counsel advised me that as part of this investigation, he interviewed numerous Bayer witnesses, including those who were in charge of Bayer's urethanes business during at least some part of the period 1994-1998.<sup>227</sup> Bayer's counsel provided me with the following information based on his internal investigation, including his interviews of the Bayer witnesses specified below:

- a. There were multilateral meetings including BASF, Bayer, and Dow in 1994 and 1995 to discuss urethanes prices.
- b. Lee Noble, Bayer Corporation's Head of Polyurethanes in NAFTA during the 1990s, stated that he had urethanes pricing conversations with Bill Long and Bob Wood of Dow and Manfred Buller and Bob Lawrence of BASF.<sup>228</sup>
- c. Noble said that Reinhard Clausius, Head of Global Strategic Marketing for Bayer AG in the 1990s, told him about price agreements for urethanes related to Europe, and told him to increase prices in the US. Noble also stated that Clausius advised him that the "Big Elephants"—BASF, Bayer, and Dow—had met and that Noble should feel comfortable raising prices in the US.
- d. Reinhard Clausius, Head of Global Strategic Marketing for Bayer AG in the 1990s, recalled two multilateral meetings among the producers in which urethanes pricing was discussed. One of the meetings which Clausius recalled was at the Swan Restaurant in Brussels in the late 1990s, and one of the meetings was a two-day meeting in which the various urethanes products were discussed. Clausius recalled

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regarding 1994-1998, I also considered testimony by Defendants' witnesses—including Jean-Pierre Dhanis, Charles Churet, Bill Long, Bob Lawrence, Dick Mericle, Bob Wood, Tom Harrick, Marco Levi, and others who had urethanes responsibilities during at least part of the period 1994-1998—who denied that they discussed pricing or reached agreements with other alleged conspirators.

<sup>226</sup> Interview of Bayer's outside counsel, April 14, 2011. Among other things, I had reviewed information contained in Plaintiffs' Second Amended Complaints and Supplemental Interrogatory Responses (Corrected Version), dated December 21, 2011, regarding urethanes pricing discussions among the defendants and others during the 1994-1998 time period. I understood that some of that information had been provided to Plaintiffs by Bayer's counsel pursuant to Bayer's agreement to cooperate contained in Bayer's settlement agreement with Plaintiffs. Accordingly, I asked to interview Bayer's counsel to confirm the accuracy and reliability of this information.

<sup>227</sup> Among many others, Bayer's counsel stated that he interviewed Lee Noble, Reinhard Clausius, Hans Joachim Kogelnik, Christian Buhse, Reinhold Lang, and Helmut Von Hagen.

<sup>228</sup> Bayer's counsel stated that Noble later recanted.

that Jean-Pierre Dhanis of BASF,<sup>229</sup> Patrick Thomas of ICI/Huntsman and Charles Churet of Dow attended at least one of these meetings.

- e. Hans-Joachim Kogelnik recalled a multilateral meeting at the Zurich airport in 1994 with BASF, Dow, and possibly ICI. Kogelnik attended with Reinhold Lang, Bayer AG's Head of Global Strategic Marketing for the Construction Market (which included MDI) and Reinhard Kaufung, who worked for Lang. At the time, Kogelnik was responsible for Bayer's U.S. automotive business, which included MDI. The participants discussed European business conditions and possibly European prices. Kogelnik said he felt uncomfortable with the subject matter being discussed.
- f. Reinhold Lang, Bayer AG's Head of Global Strategic Marketing for the Construction Market (which included MDI) in the 1990s, stated that he had urethanes pricing discussions related to Europe with BASF, Dow, Enichem (which Dow acquired in 2001), and ICI. Lang reported to Clausius. Lang stated that he had pricing discussions with: Jean-Pierre Dhanis, Joachim Roser, Werner Diehl, Goeldner and Lars Karcher of BASF; Charles Churet of Dow; Giancarlo Battiston and Herbert Verhulst of Enichem; and Steve Hubrecht of ICI. Lang said that pricing was discussed in meetings at various locations during the 1990s, including Vienna, Zurich, Budapest, Brussels, Frankfurt, Leverkusen, and Ludwigshafen.<sup>230</sup>
- g. Helmut Von Hagen, Bayer AG's Head of Global Strategic Marketing for Flexible Foam (which included TDI) in the 1990s, had urethanes pricing discussions related to Europe with BASF, Dow, ARCO, and Shell.<sup>231</sup>
- h. Christian Buhse said that, in the mid-1990s, Von Hagen—Buhse's superior at the time—brought Buhse into the urethanes pricing discussions. Buhse recalled participating in at least two meetings with Von Hagen, with BASF, Enichem, Dow, and Rhone-Poulenc. Other attendees included Otto Elle for BASF, Herbert Verhulst and Giancarlo Battistone for Enichem, and Flavio Terruzzi for Dow. Buhse said that

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<sup>229</sup> Bayer's counsel stated that Bayer witnesses he interviewed independently identified Jean-Pierre Dhanis as taking a very prominent role in the urethanes pricing discussions among the producers, both because of his force of personality and his long tenure running BASF's polyurethanes division in the 1990s and 2000s.

<sup>230</sup> Lang was involved in Bayer's U.S. operations during 1994–1998. Ex. 5710 (BC/PUR0110055–61 at 57) (February 1995 minutes showing Bayer's heads in NAFTA for the automotive business (Kogelnik) and construction business (Oestreich) had to coordinate requests for additional MDI material with Lang).

<sup>231</sup> Von Hagen was involved in Bayer's U.S. operations during 1994–1998. BC/PUR0559050–63 at 51 (Phelps expense report from 1998 reflecting meetings between Von Hagen and Bayer's customers in the U.S. for TDI and polyether polyols).

one meeting may have been in London, one may have been in Milan, and one may have been in Paris between 1993 and 1995.

- i. Other participants in the urethanes pricing discussions described above included Marco Levi of Dow, Renato Moroni of Enichem, David Sedler, Martin Dawson, and Carlos San Martin of ARCO.
- j. The individuals that were interviewed at Bayer described the urethanes pricing discussions as a process for reaching consensus for a price increase. These individuals indicated that when it was decided there was a need for a price increase, there were a series of discussions focused on making the price announcements effective.

(203) Noble and Buhse of Bayer (both discussed above), both of whom had urethanes responsibilities during 1994–1998, have invoked their Fifth Amendment right against self-incrimination in refusing to answer deposition questions concerning their involvement in price-fixing agreements with their competitors during the period 1994–1998.<sup>232</sup> In addition, it is my understanding that the depositions of Lang and Kogelnik of Bayer and Thomas of ICI (and later Huntsman) (discussed above), all of whom had urethanes responsibilities throughout the 1994–1998 time period, are being pursued overseas, and their counsel has indicated that they likewise will invoke their Fifth Amendment right against self-incrimination in response to deposition questions about their involvement in price-fixing agreements with competitors. This provides additional corroboration of the information provided by Bayer’s counsel.

(204) In addition, the following information and evidence indicates collusive activity in 1994:

- a. In the four days between February 14 and 17, 1994, Noble and Tom Harrick (Bayer’s Senior Vice President of Polyurethanes in NAFTA who reported directly to Noble)

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<sup>232</sup> Deposition of Lee Noble, September 16, 2010; Written Deposition of Christian Buhse (Plaintiffs’ questions, August 17 and September 7, 2010; Buhse’s responses, October 6, 2010).

Buhse also had urethanes responsibilities during the period 1999–2003. In addition to his disclosures to Bayer’s counsel and his Fifth Amendment invocations, documentary evidence corroborates Buhse’s involvement in the conspiracy during the 1999–2003 time period. For example, on or about January 21, 2002, Buhse met with Marco Levi of Dow. Exs. 4125–26. Shortly thereafter, on January 28, 2002, Buhse recommended internally at Bayer a change in Bayer’s previously-determined plan and recommended two substantial price increases in 2002. Ex. 37. On February 4, 2002, Bayer led an “unprecedented” TDI price increase of 15 cents, the largest TDI increase that Defendants had ever attempted during the tenure of senior TDI executives like Marco Levi of Dow and John Phelps of Bayer. Phelps Dep. 366–67; Levi Dep. 199–201. BC/PUR0182081. Just three days later, on February 7, 2002, BASF followed this unprecedented TDI increase. Ex. 4131.

had three separate one-hour meetings with Bill Long and George Byrd of Dow in Boulders, Arizona. According to Long, two of the meetings involved a polyurethane “industry discussion.”<sup>233</sup> As indicated above, Noble invoked his Fifth Amendment right against self-incrimination in refusing to answer deposition questions about these meetings with Bill Long.<sup>234</sup> Bayer (then known as Miles), BASF, Dow, and ICI announced price increases for MDI between February 28, 1994 and March 1, 1994.<sup>235</sup>

- b. Noble (Bayer), Long (Dow) and Lawrence (BASF) regularly attended industry trade association meetings in the mid-1990s. Between March 1994 and June 1994, they attended six meetings.<sup>236</sup> On May 11, 1994, at a meeting of the trade association International Isocyanate Institute (the “Triple I”) in Salvador, Brazil, Noble and Harrick (Bayer) met privately for 1.5 hours to discuss polyurethanes business with Long from Dow.<sup>237</sup> On May 25, 1994, BASF announced a price increase for MDI, which Miles and Dow followed on May 31.<sup>238</sup> Noble invoked his Fifth Amendment right against self-incrimination in refusing to answer deposition questions about these meetings.<sup>239</sup>
- c. At a meeting of the Chemical Manufacturers Association (the “CMA”) at the Greenbrier, West Virginia, on June 10, 1994, Buller (BASF), Noble (Bayer), and Long (Dow) met privately for approximately three hours with a mutual supplier, Air Products. According to Dow’s records, the attendees first met for an hour over refreshments to discuss PO and TDA, which are raw materials used by Bayer, BASF, and Dow in the manufacture of polyether polyol products.<sup>240</sup> Then they met for two more hours over dinner to discuss “polyurethane industry growth.”<sup>241</sup> Noble invoked his Fifth Amendment right against self-incrimination in refusing to answer deposition

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<sup>233</sup> Ex. 5302.

<sup>234</sup> Deposition of Lee Noble, September 16, 2010, at 33-37.

<sup>235</sup> BASF Corporation US 477756-63.

<sup>236</sup> Exs. 5302-08, 5675.

<sup>237</sup> Ex. 5306.

<sup>238</sup> BASF Corporation US 4445781; BASF Corporation US 477754; BASF Corporation US 477750.

<sup>239</sup> Noble Dep. 43-46.

<sup>240</sup> Ex. 5308.

<sup>241</sup> Ex. 5309. Long testified that there was no set agenda and he did not get clearance from Dow’s lawyers for the meeting among suppliers. Long Dep. 124-26.

questions about these meetings. BASF, Miles, Dow, and ICI announced price increases for MDI in late August and early September.<sup>242</sup>

(205) There is also additional evidence of continued conspiratorial activity in 1995 through 1997:

- a. On October 4, 1995, Dhanis (BASF's President of Polyurethanes) sent a memo to Wayne Godwin (BASF's President of Polymers in NAFTA), and Bob Lawrence (BASF's Group Vice President of Polyurethanes in NAFTA).<sup>243</sup> In the memo, Dhanis offered two models of a "proposed scheme of cooperation," in which the "TDI players' worldwide number will be reduced," referring to global TDI capacity.<sup>244</sup> Dhanis used colors as code names for the urethanes manufacturers.<sup>245</sup> Dhanis concluded, "We encourage you to have a preliminary discussion with Orange and Amber to find out what their PU strategy is."<sup>246</sup> Neither Lawrence nor BASF could explain this document.<sup>247</sup> Richard Mericle of BASF followed up with "Amber" a/k/a ARCO to determine their polyurethanes strategy in NAFTA. On January 26, 1996, Mericle wrote to Lawrence and others at BASF: "If ARCO is sincere in the previous comments regarding no designs on TDI in North America, they should also welcome the opportunity to exit the Canadian market with their current supply travail."<sup>248</sup> Lawrence could not explain why Mericle made this comment.<sup>249</sup>
- b. On February 18, 1997, Dow representatives Churet, Long and Dave Pashalidis met with BASF representative Friedrich Vogel (BASF's Global Vice President of TDI, MDI, and polyols, who reported to Dhanis), in Singapore.<sup>250</sup> A few days later, BASF, Bayer, Dow, and ARCO announced polyols and TDI price increases.<sup>251</sup> On or around April 1, 1997, when those price increases became effective, Churet met with Joachim Streu (BASF's director of marketing who reported directly to Vogel). According to Streu's minutes, Churet and Streu discussed TDI and polyols being purchased from

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<sup>242</sup> BASF Corporation US 477743; BASF Corporation US 477744; BASF Corporation US 4445807; BASF Corporation US 477745; BASF Corporation US 4445796.

<sup>243</sup> Ex. 5691.

<sup>244</sup> Ex. 5691.

<sup>245</sup> Ex. 5691.

<sup>246</sup> Ex. 5691. Plaintiffs believe that, among the code names, "Amber" represents ARCO.

<sup>247</sup> Lawrence Dep. 191–201; Lane Dep. 603–607.

<sup>248</sup> Ex. 5702.

<sup>249</sup> Lawrence Dep. 253.

<sup>250</sup> Ex. 5932.

<sup>251</sup> LPI\_000097698; BC/PUR0076719; FSI\_000000120; BASF Corporation US 4445908.

Dow.<sup>252</sup> Shortly thereafter at a Triple I meeting in Phoenix in May 1997, Churet again met with Jean-Pierre Dhanis and Friedrich Vogel of BASF to discuss TDI purchases.<sup>253</sup>

(206) There also is evidence of continued conspiratorial activity in 1998:

- a. Stephanie Barbour (Dow's Global Appliance Director and a Product Manager for North America) testified that, in either 1998 or 1999, while Churet was Dow's Commercial Director for North America and Europe, Churet came to Dow's offices in the United States and told his subordinates, Barbour and Rick Beitel (Dow's Sales and Marketing Director for North America), that they needed to raise polyurethane prices.<sup>254</sup> Beitel and Barbour argued that it was not a good time for a price increase because of supply and demand conditions, but Churet was adamant that they should raise prices.<sup>255</sup>
- b. After the meeting, Barbour was in the hallway with Dow colleagues Marco Levi (Sales Director for Western Europe and Israel) and Steven English (Product Market Manager for Europe between 1996 and 1998; Global Marketing Manager for Molded Foams between 1999 and 2000), who also reported to Churet. Barbour shook her head and asked, "What was that about?" Levi and English responded, "Where was Charles last week?" Barbour said, "I don't know," and they said, "He was at a Triple I meeting." Barbour responded, "So?" They said "You'll learn," referring to Defendants' pricing discussions and agreements at urethanes trade association meetings.<sup>256</sup> Churet was heavily involved in trade association activities during the late 1990s.<sup>257</sup>
- c. Consistent with Clausius' recollection of attending a pricing meeting with Jean-Pierre Dhanis of BASF and others at the Swan Restaurant, and with Bayer witnesses'

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<sup>252</sup> Ex. 5933.

<sup>253</sup> Ex. 5935 (BASF Corporation US 107536).

<sup>254</sup> Deposition of Stephanie Barbour, September 14–15, 2010, 474–475.

<sup>255</sup> Barbour Dep. 474–475. Churet testified that he often came to Midland starting in 1998 when he assumed responsibility for North America, and that he held 2-3 pricing strategy meetings per year with his sales and marketing team. Deposition of Charles Churet, January 12, 2011, at 227–30.

<sup>256</sup> Barbour Dep. 474–479.

<sup>257</sup> Churet Dep. 71–77, 85, 189, 220–221 (discussing his trade association activities with the Triple I and the European Diisocyanate Polyol Producers Association ("ISOPA") during the late 1990s).

description of Dhanis as a strong participant in the pricing discussions, Dhanis hosted at least two meetings with competitors at the Swan Restaurant in 1998.

- d. First, on January 12, 1998, Dhanis (BASF), Vogel (BASF), Wood (Dow) and Churet (Dow) met at the Swan.<sup>258</sup> Then, on May 28, 1998, Dhanis hosted two meetings, one at the Swan Restaurant, and another at the nearby Radisson Hotel, where Clausius was staying that day.<sup>259</sup> In his deposition, Dhanis acknowledged that he met with Clausius on several occasions to discuss business matters between BASF and Bayer.<sup>260</sup> The May 1998 Swan meeting coincided with price increases for MDI, TDI, and polyols. Bayer announced a price increase for MDI on May 22, which Dow followed on May 28 (the same day Dhanis hosted a meeting at the Swan and met with Clausius at the Radisson), and BASF followed on June 1.<sup>261</sup> Dow also announced an increase for TDI and polyols on May 28, which ARCO, Bayer, and BASF followed between May 29 and June 1.<sup>262</sup>
- e. Between February 19 and March 1, 1998, Churet (Dow) held four separate meetings with his counterparts at Bayer, BASF, and ARCO in Europe.<sup>263</sup> Churet's meetings coincided very closely with price increase announcements for MDI by Bayer, BASF, Dow, and ICI, and for polyols by Dow, BASF, Bayer, and ARCO.
- f. On February 20, 1998, Noble and Tom Harrick (Bayer) met with Bill Bernstein (BASF's head of urethanes in NAFTA) and Richard Mericle (BASF's director of urethanes chemicals, who reported to Bernstein) at Bayer's Baywood complex, near Pittsburgh.<sup>264</sup> In a memo from Bernstein to his supervisor, Bill Lizzi, Bernstein said

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<sup>258</sup> Ex. 1373. Though Clausius is not listed as an attendee on Dhanis's dinner receipt, Clausius's day calendar for this date contains a sole entry – “Fr. Vogel.” Ex. 5936.

<sup>259</sup> Clausius did not include a business purpose on his expense report for his trip to Brussels. Ex. 4369–70.

<sup>260</sup> Dhanis Dep. 211, 215–18.

<sup>261</sup> FSI\_000000192; FSI\_000000231; FSI\_000000163.

<sup>262</sup> BASF Corporation US 4441085; BASF Corporation US 4441086; BASF Corporation US 4441088; CFI\_000005941; HSM\_000000277. ICI also followed the polyols increase on June 1. BASF Corporation US 477706.

<sup>263</sup> Ex. 5940, 5941.

<sup>264</sup> Larry Stern of Bayer testified about his discussions with Bill Bernstein about urethanes pricing, and documentary evidence demonstrates that Bernstein was involved in a number of pricing discussions with BASF's competitors during the class period. For example, three days after Bernstein met with Hans Kogelnik of Bayer in September 1999, near Pittsburgh, a message pad of Bernstein's reflects a call from Kogelnik that states: “Sept. increase – where, who, why.” Exs. 1492–93. Additionally, on March 6, 2001, an internal BASF memo written by Bernstein stated that BASF was “deciding on course of action” with regard to the price increases. Ex. 1527. On March 8, 2001, Bernstein sent an email to subordinates stating that “I have tried to determine what Huntsman's response will be but have not connected.” Ex. 1521. That day and the next, while traveling, Bernstein made 8 phone calls to Tony Hankins of Huntsman. Ex. 1528; Bernstein Dep. 206–28. On March 9, 2001, BASF and Huntsman both

that during the meeting BASF and Bayer discussed Bayer providing “significant quantities” of MDI to BASF in exchange for BASF delaying new MDI capacity in the United States.<sup>265</sup> Mericle admitted that delaying new capacity was “not a reason for, nor should it be a consideration, in terms of swaps,” because it could be seen as an agreement to restrict supply for MDI.<sup>266</sup> Yet in 1998 and 1999, Hans Kaiser of Bayer and Jean-Pierre Dhanis reached an agreement for Bayer to provide BASF with TDI in exchange for BASF’s agreement to postpone a planned TDI capacity expansion by six months.<sup>267</sup> Dhanis admitted that, as a condition of this swap, BASF “told to Bayer that we agree on the postponement” of its planned TDI capacity expansion in the United States.<sup>268</sup>

- g. On May 8, 1998, at a Triple I meeting in Prague, Bernstein (BASF) and Clausius (Bayer) met privately over lunch to discuss U.S. market conditions for polyurethanes.<sup>269</sup> As noted above, the manufacturers announced price increases for urethanes products in late May and early June.<sup>270</sup>
- h. In September 1998, Clausius (Bayer) spoke with Churet (Dow). Clausius wrote to his boss, Hans Kaiser, that Churet told him that he had been getting “very obvious pressure from America to implement the price hike by any means necessary.”<sup>271</sup>

### 5.7.3. Defendants’ organizational structures

(207) The evidence and information available to me indicates that BASF and Bayer organized their global urethanes businesses so as to afford their European executives a high degree of influence and control over the pricing of urethanes products in the United States.

#### 5.7.3.1. BASF

(208) BASF created BASF Coordination Center Comm. V. (“BCC”) between 1993 and 1994.<sup>272</sup> Through BCC, which was headquartered in Brussels, Belgium, BASF coordinated and

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followed Dow’s and Bayer’s price increases.

<sup>265</sup> Ex. 5328.

<sup>266</sup> Mericle Dep. 113–14. Harrick had no recollection of the meeting. Deposition of G. Thomas Harrick, November 10, 2010, 185–90.

<sup>267</sup> See Exs. 1593, 4671; BC/PUR0067797–803.

<sup>268</sup> Dhanis Dep. 68–69, 131–32.

<sup>269</sup> Ex. 1608-09; BASF Corporation US 458199–206.

<sup>270</sup> See footnote 262.

<sup>271</sup> Ex. 5946.

controlled the activities of its urethanes-selling affiliates around the world, including the United States.<sup>273</sup> During the pre-class period, BCC was “pushing to be involved” in BASF Corp.’s decisions on pricing, capacity, and decisions to enter markets—even when the relevant matters were not global in nature.<sup>274</sup> Evidence and information available to me indicates that BCC, and Jean-Pierre Dhanis in particular,<sup>275</sup> had significant influence and control over BASF Corp.’s decisions regarding urethanes prices and even specific NAFTA customers. BCC had ultimate profit and loss responsibility for MDI, TDI, and polyols globally<sup>276</sup> and thus considerable oversight authority over the NAFTA region.<sup>277</sup>

(209) BASF Corp. executives regularly sought and complied with BCC’s guidance.<sup>278</sup> BASF Corp. executives sought BCC’s approval of or input regarding a price increase, and BCC executives otherwise often provided input regarding pricing globally and regionally.<sup>279</sup> For example,

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<sup>272</sup> Lane Dep. 46–47, 493–94, 97; Dhanis Dep. 23–24; Ex. 4378.

<sup>273</sup> Dhanis Dep. 22–24 (testifying that BCC was created to develop and implement a global strategy for the polyurethanes business); Lane Dep. 493–94 (“BCC is a coordination center, acts as the headquarters for the division KU or HU [the global polyurethanes business unit at BASF], as it was known, from, I believe, 1994 globally, and so within the coordination center, as the headquarters will do, we’ll do strategic planning, develop strategies, and support major investments for each of the regional business units.”)

<sup>274</sup> Lizzi Dep. 38–39, 110–11; 180–93 (Lizzi testified that “I think KU wanted more involvement in the NAFTA region, whether they [the customers] were global or not global...”).

<sup>275</sup> Lizzi Dep. 206 (noting that “Jean-Pierre Dhanis gives his opinion on everything, or did...”).

<sup>276</sup> Lawrence Tr. at 38–42, 67–68, 75, 135–136 (describing the “Bereichsleiter,” i.e., the head of polyurethanes, Jean-Pierre Dhanis, as being the person responsible for MDI, TDI, and polyols globally, including profit and loss and capital requirements), at 98–99 (stating that BCC played a role in determining what the margins should be for TDI, MDI and polyols; there was a corporate worldwide objective).

<sup>277</sup> For example, BCC had oversight authority to approve or deny NAFTA’s annual budget, which included NAFTA’s expected sales, revenue and costs. Lawrence Dep. 41–42. See also Lane Dep. 516–18 (stating that BCC executives did not set the price targets, but they would have been involved in monitoring the profitability of the businesses globally from a strategic standpoint, i.e., how return on investments and return on assets are trending year over year, and whether BASF was achieving its strategic targets; BCC executives set and monitored the NAFTA region’s profitability targets).

<sup>278</sup> Roger Huarng, Manager of Rigid Business for BASF Corp. during the class period, testified that BCC helped BASF Corp. make sure its prices were in line so that it would not “raise our price too high and start to [attract] a lot of foreign producers that are, you know, import -- send product over here.” See Deposition of Roger Huarng, September 22, 2010, at 132–33:

Q. During your time as Rigid business manager, do you recall BASF AG or the coordination center over in Brussels, the people there, ever advocating to the people over in the U.S. at BASF Corporation to raise prices?

A. Yes. In the position -- there job is coordination, so they will be sending the information on a regular basis, what are the price in each region. What is the main forecast for each region. What’s our balance, you know, so we can see, you know, the growth is reaching, you know, the -- the -- by industry, what kind of price level they are getting to.

And we trend it to be a strategic price we know, what is arbitrage, you know, what is our price here. So we don’t want to attract, you know, raise our price too high and start to track a lot of foreign producers that are, you know, import -- send product over here. So we have to try to raise our price as high as we can and avoid arbitrage issues.

You know, so we -- they are giving -- I can see how well they’ve been doing in Asia, raising the price, sometimes faster than I am, so I have to catch up, you know, to keep material in the region. I know how that works. That’s a process and we just have to, you know, be reminded about what’s going on in the -- for the rest of the world.

<sup>279</sup> See, e.g., Ex. 5689 (BASF Corporation US 44741664) (August 28, 1995 memo from Lawrence to Vogel, Global

during a conversation in 1998, Dhanis and Lizzi discussed, among other things, whether BASF should lead a TDI price increase and the fact that BASF Corp. was strongly supporting an MDI and polyols price increase.<sup>280</sup> Lizzi asked Dhanis to call Bernstein (BASF Corp.'s Group Vice President for Urethanes in NAFTA) regarding these topics.<sup>281</sup> In another example, Dhanis insisted, successfully, that BASF Corp. reverse its course from a position already taken and rescind an offer to delay a price increase to Foamex, a major U.S. urethanes customer.<sup>282</sup> In another instance, BCC weighed in and advised BASF Corp. against meeting a competitive offer from Bayer at a major TDI customer, Woodbridge.<sup>283</sup> In addition, a memo dated November 13, 1998, reflects an agreement with BCC that BASF Corp.'s pricing decisions with a duration of six months or more would have to be discussed with BCC.<sup>284</sup>

(210) BCC also influenced pricing in the U.S. by directing where its affiliates would sell TDI, MDI, and polyols and coordinating supply for these products globally. For instance, Bob Lawrence testified that he had to get approval from the director of global polyurethanes marketing in Ludwigshafen<sup>285</sup> to get additional MDI imported from BASF in Europe to sell in NAFTA.<sup>286</sup> BASF Europe had the responsibility for determining whether it was financially advantageous for BASF to sell that MDI in the U.S. relative to other markets; Lawrence's group in NAFTA

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Vice President of TDI, MDI, and Polyols in Europe, advising him that Bayer had increased prices for TDI and that: "We would propose to support this increase. We would appreciate your comments and any other thoughts you might have."; Ex. 5697 (BASF Corporation US 4448777-79) (September 26, 1997 memo from Streu forecasting 1998 prices and volumes, emphasizing the desire to raise prices and concluding "please support all efforts to increase prices now and even next year."); Ex. 5698 (BASF Corporation US 4448776) (October 13, 1997 internal memo from Lawrence saying "The message in Dr. Streu's memo is clear. Conditions (supply/demand) are such that we should be able to effect price increases on MDI in 1998"); Mericle Dep. 29 (BCC executives in Brussels provided input to NAFTA regarding global pricing trends); Lane Dep. 518-20 (BCC tracked global supply and demand for urethanes and provided this information to the NAFTA regional business unit. In addition, BCC and BASF Corp. shared pricing information; BCC maintained an aggregated view on pricing reported by the regions).

<sup>280</sup> Ex. 4014 (BASF Corporation US 507737).

<sup>281</sup> Ex. 4014 (BASF Corporation US 507737).

<sup>282</sup> On April 28, 1999, Dhanis had a conversation with Bernstein about BASF Corp.'s decision, already communicated to Foamex, to delay a price increase by 30 days. Dhanis demanded an explanation from Bernstein's supervisor, Lizzi, before Dhanis would "allow" Bernstein to contact the customer to rescind the 30 day delay. Ex. 4065 (Lizzi 00000006). The next day, BASF informed Foamex—apparently at Dhanis' urging—that they would not delay the price increase. Ex. 4064 (Lizzi 00000010). Ultimately, BASF made the "global strategic decisions" either not to reduce prices or not to delay price increases to its two largest flexible foam customers, Foamex and Carpenter. Ex. 4063 (Lizzi 00000007). Dhanis initially denied being involved in this, insisting that it was not his job to tell BASF Corp. to reverse a decision to delay price increase to Foamex, but Dhanis conceded his role when confronted with the documentary evidence. Dhanis Dep. 104-17.

<sup>283</sup> See Ex. 5566 (BASF Corporation US 4453921-22).

<sup>284</sup> Ex. 4020 (Lizzi 00000012).

<sup>285</sup> BASF's polyurethanes headquarters was moved from Ludwigshafen to Brussels when BASF created BCC around 1993 or 1994. Lane Dep. 496-97. The director of global polyurethanes marketing was based with this group. See Ex. 7000.

<sup>286</sup> Lawrence Dep. 179.

was not involved in that kind of analysis.<sup>287</sup> Likewise, the NAFTA regional business unit had to get approval from BCC to expand capacity for urethanes in the U.S.<sup>288, 289</sup>

### 5.7.3.2. Bayer

(211) Prior to 1995 the Bayer AG regional business unit responsible for marketing and sales of urethanes products in North America was Miles Inc. In 1995, Miles changed its name to Bayer Corporation.<sup>290</sup> Documentary evidence and information provided by Bayer show that Bayer's high-level executives in Europe took an active role in directing pricing and supply decisions in North America. For example, as noted above, Lee Noble (Bayer's head of urethanes in NAFTA) indicated that Reinhard Clausius (Bayer's global strategic marketing director in Germany) told Noble about pricing agreements among urethanes competitors relating to the Europe and told Noble to implement price increases in NAFTA.<sup>291</sup> In addition, Lang and Von Hagen, discussed above, were both based in Germany and were involved in Bayer's North American business operations.<sup>292</sup>

(212) While Tom Harrick (Bayer's director of strategic marketing in NAFTA) testified that no one from Bayer AG ever told him to raise prices in the U.S. market,<sup>293</sup> evidence in the record contradicts this contention. In February 1995, Harrick attended an internal, semi-annual urethanes business meeting along with other executives of Bayer AG (including Reinhard Clausius and Hans Kaiser) and Miles (including Lee Noble). According to the minutes of the meeting, which was dedicated to NAFTA, Dr. Kaiser stated that “[a]ll of the business groups

<sup>287</sup> Lawrence Dep. 179–80; Ex. 5686 (BASF Corporation US 4448746) (March 13, 1995 Bob Lawrence memo to Dr. Reinmoeller of BCC states “our ability to hold customers and/or grow market share is dependent on our ability to get material from Europe”).

<sup>288</sup> Ex. 5671; Lawrence Dep. 38 (explaining the purpose of Ex. 5671, a Geismar TDI Optimization report, as a marketing justification report which NAFTA prepared for BCC to justify a TDI expansion at BASF's Geismar plant; the anticipated new capacity at Geismar was also “premarketed” for sale to BASF's customers in Europe, meaning that some of that new U.S. capacity was made available for export from the U.S. to Europe).

<sup>289</sup> In addition, pursuant to a “TDI Charter” between NPU (BASF Corp.) and HUM (BASF Europe), the NAFTA region had to make 25 million pounds of TDI available for export to the world market on a sustained basis, even though Geismar capacity could have been fully utilized by the North American market. Lawrence Dep. 66–69; Ex. 5671. The NAFTA region sold “quite a bit” of TDI in the export market during Lawrence's tenure. Lawrence Dep. 69.

<sup>290</sup> Bayer Corporation is a U.S. subsidiary of Bayer AG, which is headquartered in Leverkusen, Germany. Stern Dep. 32–33.

<sup>291</sup> See *infra* ¶ (202)c.

<sup>292</sup> See, e.g., BC/PUR0559050–63 at 51 (Phelps expense report from 1998 reflecting meetings between Von Hagen and Bayer's customers in the U.S. for TDI and polyether polyols); Ex. 5710 (BC/PUR0110055–61 at 57) (February 1995 minutes showing Bayer's heads in NAFTA for the automotive business (Kogelnik) and construction business (Oestreich) had to coordinate requests for additional MDI material with Lang).

<sup>293</sup> Harrick Tr. at 108.

are expected to improve profitability in 1995,” and highlighted “the need to emphasize price increases in 1995.”<sup>294</sup> Harrick followed Kaiser’s directive to increase prices, even though he believed they would unlikely be successful. Indeed, minutes from the next semi-annual meeting in October 1995 provide, “Mr. Harrick comments that price increases are/will be announced in the market although realistically chances to succeed appear somewhat limited.”<sup>295</sup>

(213) Evidence further shows that Bayer AG executives in Germany exerted considerable influence and control over supply and pricing of urethanes products at specific customers in the United States. First, the heads of Bayer’s regional business units in NAFTA had to coordinate with the global product managers, like Reinhold Lang for MDI, to request additional supply to meet increasing demand needs in NAFTA.<sup>296</sup> In 1995, Clausius asked that Bayer Corp. contracts with truly global customers, like Whirlpool, be coordinated with Bayer AG.<sup>297</sup> In fact, Bayer AG executives were highly involved in strategic supply and pricing decisions for key global customers. In 1996 Von Hagen of Bayer AG made a strong recommendation to Bayer Corp. to forego additional TDI market share at a global customer, Woodbridge, so as not to disrupt the market.<sup>298</sup> On another occasion, in December 2002, Wolfgang Friedrich (Bayer’s head of global strategic marketing for insulation, with responsibilities for MDI), who was based in Germany, reprimanded his Bayer colleagues in the United States for “Moving into Firestone, grabbing additional volume” rather than sticking with the strategy of “No increase in Market share...substantial price increase across all segments and regions.”<sup>299</sup> Friedrich summarized the action as a “disgrace and a tremendous disappointment!!!”<sup>300</sup>

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<sup>294</sup> Ex. 5334 (BC/PUR0110055–61 at 56).

<sup>295</sup> The minutes further indicate that Bayer forecasted sales prices for MDI, polyether polyols, and TDI to rise only slightly in 1996, and that except for MDI, variable costs would decrease in that year. BC/PUR0110869–922 at 872 (emphasis added). As context, in making this comment, Harrick was responding to a concern that “Bayer AG members specifically expressed [] to get a clear definition of the temporal and financial consequences of price announcements in the U.S.,” and a suggestion by Clausius to “have a rolling 4 quarter preview of sales prices on product group levels. BC/PUR0110869–922 at 872.

<sup>296</sup> Ex. 5334 (Bayer meeting minutes state that NAFTA regional heads for automotive (Kogelnik) and construction (Oestreich) were to coordinate requests for additional MDI with Lang to meet increasing demand in NAFTA; coordinating amounts and timing requirements with Bayer MDI product management (Lang) is critical for MDI).

<sup>297</sup> Ex. 5334 (BC/PUR0110055–61 at 57).

<sup>298</sup> BC/PUR0076786; Ex. 5332.

<sup>299</sup> Ex. 274 (BC/PUR0133304–07 at 05–06) (Jerry Phelan’s handwritten notes made during or directly following a December 2002 phone call he had with Friedrich indicate that Friedrich said he was going to “talk to Nuremberg [Bayer’s President of Polyurethanes in Germany] & the Board to let them know that NAFTA does not know how to run their [business],” and that “it is this type of action that will cause people to lose their jobs”); Deposition of Gerald Phelan, October 15, 2009, at 114–123, 274–278.

<sup>300</sup> European executives from Dow and ICI also had significant influence and control over pricing of urethanes

## 5.8. The relationship between prices in the United States, Europe, and elsewhere

(214) Much of the evidence summarized above pertains to the involvement of European executives in a conspiracy during the period 1994 through 1998 (as well as 1999 through 2003). Accordingly, I asked my staff to compile evidence, favorable and unfavorable, regarding whether prices in the United States were related to prices in Europe and elsewhere. Although there is evidence pointing both ways, I conclude that on balance there was such a relationship. Because there is such a relationship, had defendants' conspiracy substantially elevated prices in Europe during 1994 through 1998, defendants' conspiracy would necessarily have increased prices in the US.

(215) One reason for this conclusion is that, as noted in section 5.7.3, Defendants' own business organizations were structured to coordinate urethanes business activities, including pricing, across the globe. In addition, this conclusion is supported by other evidence and information, including testimony by Defendants' executives, Defendants' price increase announcements, Defendants' internal business documents, and the fact that polyether polyol products and their raw materials are traded globally.

### 5.8.1. Testimony by Defendants' executives

(216) In deposition testimony, a number of high-level executives responsible for running Defendants' urethanes businesses testified that prices across regions, including the United States, are linked by global trade.

- David Fischer, Dow's global vice president of polyurethanes, testified that TDI prices outside of North America influenced TDI prices inside North America.<sup>301</sup>

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products during the pre-class period. While Dow was headquartered in Midland, Michigan, Charles Churet, Dow's Commercial Director for Europe and North America in 1998, was based in Switzerland. Commercial Directors' compensation was tied in part to the profitability of the global urethanes business. Long Dep. 54–58. In addition, ICI was headquartered in Belgium, and its managing director of the global urethanes business (Patrick Thomas starting in 1998) was based there. Geaman Dep. 558–60; Ex. 7085. The regional director of America reported to the managing director in Belgium. Geaman Dep. 558–60; Ex. 7085. Huntsman's Rule 30(b)(6) witness, Greg Geaman, testified that the managing director was responsible for the overall profitability of the global urethanes business and pricing is half of that equation. See Geaman Dep. 558–59.

<sup>301</sup> See Deposition of David Fischer, April 30, 2010, 353:

Q. Did the prices in regions outside of North America exert any influence on prices inside North America for TDI?

A. Yes.

Q. How so?

- Greg Geaman, testifying on behalf of Huntsman International, said that regional prices could not generally be “widely disparate,” because product would flow across the globe in response to such price differences.<sup>302</sup>
- Jean-Pierre Dhanis, President of BASF Coordination Center, testified that if prices differed by more than 10% across regions, the imbalance would cause a “problem” with customers deciding to import or export.<sup>303</sup>
- Christopher Rieker, director of global marketing for polyurethane basic products at BASF Coordination Center, similarly testified that if prices across regions differed by more than transportation costs, there would be “significant flow of product from one region to another, and that then can lead to a significant drop in the price” in the region with higher prices.<sup>304</sup> Rieker also noted that such an imbalance would lead to “traders who take advantage of a product being offered in one region at a very low price, and their opportunities to sell it at a much better price in another region, so which, at the end of today, helps to level out those price differences.”<sup>305</sup>

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A. Depending on any specific moment in time what the import and export balance of TDI coming in or out of the United States or Europe, they would have an impact on prices within that geography.

<sup>302</sup> Gregory Geaman Dep. (Huntsman International 30(b)(6) testimony), Nov. 30, 2010, at 220:

[I]f our price is significantly higher, customers complain and say why is the price lower in Europe. If our price is lower, they try to ship it to Europe. Customers will try to basically, because a lot of the people we deal with are multi-national companies . . . any time in this world that there is an arbitrage situation, if there's a penny to be made, some enterprising trader will find a way to buy product in one region and move it to another. That's—that's one of the reasons you don't see them, generally, getting to widely disparate in pricing.

<sup>303</sup> Dhanis Dep. 70–71:

Q. During your tenure as president of the polyurethanes division, did BASF's NAFTA business pursue a market share or a price strategy?

A. Certainly market share, but it depends on the timing. It means if your contribution margin is totally negative, then you have sometimes to react, to try to stop the decrease, to stop the decrease, it depends on the contribution margin.

And secondly, you have to take care sometimes that—you have to understand that the global business, the price—if you have different price between region, and the price difference is more than 10 percent, you have a problem with export.

It means we have to take care on the end that the pricing is—I will say, is not disturbing for the region.

Q. So if the price differential between Europe and the United States is too large, people will buy from overseas, correct?

A. Some customer could buy from overseas, yes.

<sup>304</sup> Rieker Dep. 138–39:

There is a logical difference between prices which, essentially, is reflected by the transportation costs, okay, so if a product is offered in one region at a price which is lower than the transportation costs to bring the product from one region to the other, then you will—the factor that I just described, you will have traders who will buy the product in one region and transport it to the other region and try to sell it at a price which is higher than the price they bought it for and the transportation that they had to pay for it.

So that is the logical difference that you can see between regions, which is normal.

If the range broadens, then you will have significant flow of product from one region to the other, and that then can lead to a significant drop in the price.

<sup>305</sup> Rieker Dep. 136–37.

- Bayer told the FTC that after it bought Lyondell's polyols business in 2000, prices would not rise, because “[p]ost merger, there will remain at least six substantial domestic producers [of polyols] plus imports.”<sup>306</sup>

(217) Some witnesses testified that prices can differ across regions and that prices do not always move uniformly across regions.<sup>307</sup> Overall, however, the testimony seems consistent with the proposition that, while regional prices might diverge from time to time (as a result of the costs of transportation across regions, for example), large divergences are unlikely to persist for a long period of time. This is so because of economic forces, such as the threat of arbitrage, combined with existing and substantial international trade, that cause prices to move together.

(218) Huntsman's interrogatory responses likewise acknowledged that its regional prices are based on and affected by a number of variables, including, but not limited to, **supply-and-demand** on both a regional and **global level**, the condition of regional economies, **the condition of the global economy**, the presence of competition in a particular region, *imports into particular regions*, raw material and energy cost differences, variable cost differences, *transportation* and *packaging costs*, *currency fluctuations*, types of Polyether Polyol Products sold, and credit/payment terms.<sup>308</sup>

<sup>306</sup> Bayer, Presentation to the Federal Trade Commission, Nov. 23, 1999, BC/PUR0432075–102 at 100.

<sup>307</sup> See, e.g., Hubrecht Dep. 36 (noting pricing varied country-by-country in Europe) and 120–21 (noting brokers' activity is typically a short-lived phenomenon); Deposition of John Feldmann, May 26, 2010, at 43–44 (noting that if you would compare prices between Europe, Asia, and North America, they are not identical, with regional considerations responsible for the prices' differences); Bill Bernstein, BASF Corporation's president, Lizzi 0000021-026 at Lizzi 0000023 (noting that “[w]hat we do in NAFTA does, not, to any degree impact pricing levels in other regions” in response to Lizzi 0000025, in which a BCC employee notes “Polyurethane Basic Products is a Core Business of BASF with global supply, material flow and customer structures. Pricing decisions with major customers within one region will always influence pricing policy and profit margins in other regions.”)

<sup>308</sup> Huntsman International LLC's Objections and Answers to the Direct Action Plaintiffs' Second Set of Interrogatories Directed to All Defendants at 46–47, Aug. 2, 2010 (emphases added to highlight **global conditions** and *international trade/transportation considerations*).

Huntsman also noted, “For example, some times MDI prices in Europe were higher than in the U.S. and some times they were lower. MDI prices in Europe, Asia, and the U.S. moved in similar directions, although not necessarily in the same amounts, during some time periods, and in different directions at other time periods.” Huntsman International LLC's Objections and Answers to the Direct Action Plaintiffs' Second Set of Interrogatories Directed to All Defendants at 46, Aug. 2, 2010.

Huntsman, in its Rule 30(b)(6) testimony, further explained that “You'll see that the prices will generally go in the same general direction, [but] that the amplitude of the moves will be different. Sometimes the price in America will be lower, sometimes it will be higher, but a lot of times, like in '05, you see them all going up all over the world.” Gregory Geaman Dep. (Huntsman International 30(b)(6) testimony), Nov. 30, 2010, at 219

### 5.8.2. Defendants' contemporaneous justifications for price increases

(219) At my direction, my staff compiled a collection of price increase letters and announcements from 1992 to 2008. The announcements did not always offer a justification for price increases. When justifications were offered, they often included one or more of the following reasons: increasing demand; tight supply; or increasing costs, particularly raw material costs.

(220) The price announcements, even those pertaining solely to US prices, often explicitly cited global considerations. For example:

- “Bayer is announcing a \$0.06/lb. price increase on TDI products effective October 1, 1995 (see attached letter). **Sales of TDI continue to grow at a strong rate worldwide. In spite of debottlenecking projects here and in Europe, supply is scarcely keeping pace with demand.** This affect [sic] has been felt in the American Flexible Slabstock Foam Market for over a year.”<sup>309</sup>
- “Effective January 1, 1997, Bayer will increase the selling prices of [...] TDI isocyanates by US \$0.06/lb. . . . **Worldwide demand for TDI products has increased in the last few months and we expect the trend to continue.**”<sup>310</sup>
- “Effective April 1, 1998, Bayer Corporation will increase the selling prices of all Mondur polymeric and monomeric MDI products by \$0.06/lb. **MDI demand in 1998 will increase both domestically and globally. Availability will remain tight.**”<sup>311</sup>

(221) Likewise, BASF noted that it had “low inventories and overall tightness in supply” in a February 27, 1995, price increase letter covering polymeric and monomeric MDI.<sup>312</sup>

(222) Defendants' contemporaneous announcements concerning the global factors affecting US pricing are corroborated by internal decision-making documents. For instance, ICI noted that

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<sup>309</sup> Bayer to MPI, Inc. (a purchaser located in Texas), letter, Aug. 28, 1995, LPI\_000097659 (emphasis added).

<sup>310</sup> Bayer to Vallefoam Industries Inc./Domfoam International Inc. (a purchaser located in Ontario, Canada), letter, Nov. 27, 1996, BC/PUR0074724 (emphasis added).

<sup>311</sup> Bayer to Foam Supplies (a plaintiff purchaser located in Missouri), letter, Feb. 20, 1998, FSI\_000000195 (emphasis added). Bayer sent another price increase letter with the same language to Foam Supplies on May 22, 1998 (except the increase applied only to polymeric MDI, and not monomeric MDI), FSI\_000000192.

<sup>312</sup> BASF Corporation to UCSC (a purchaser located in New Mexico), letter, Feb. 27, 1995, BASF Corporation US 4458623–24.

at its Geismar, Louisiana, a “major expansion is planned in 4Q99 to meet growing worldwide demand for MDI.”<sup>313</sup>

### 5.8.3. International trade flows in polyether polyol products

(223) There is substantial international trade in polyether polyol products. As noted in section 5.2.3, the United States exported substantial amounts of its TDI, MDI, and polyether polyols production. Figure 43 compares the United States to Western Europe, specifically, it shows how much of each region’s production is exported.<sup>314</sup>

**Figure 43 US and Western Europe net exports**

Product	Net Exports as a Percentage of Production	
	United States	Western Europe
TDI	35%	41%
MDI	23%	24%
Polyols	27%	22%

Source: SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Sept. 1998, at 5; SRI Consulting, “Polyether Polyols for Urethanes,” *CEH Marketing Research Report*, April 1999, at 4.

(224) Figure 43 shows that Western Europe and the United States exported product at roughly similar rates, although there are differences product by product:

- Western Europe exported slightly more of its TDI than did the United States.
- The two regions each exported approximately a quarter of their MDI production.
- Western Europe exported slightly fewer of its polyether polyols than did the United States.

(225) Product from the United States and Western Europe was exported into the same regions across the globe, primarily Asia. Approximately 40% of both Western European and US exports of TDI were shipped to destinations in Asia.<sup>315</sup> MDI exports to Asia were 20% and

<sup>313</sup> ICI Polyurethanes Geismar, LA Site Fact Sheet, May 11, 1999, HC000689224–25 (emphasis added).

<sup>314</sup> Because these numbers are net of imports, they are conservative and may underestimate the extent of exports. In other words, for each ton that the United States or Western Europe imported, one ton was subtracted from the region’s exports. If a region exported all its production but imported an equal amount to consume, this approach would indicate that zero percent of the production went to net exports.

<sup>315</sup> SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, Feb. 2002, at 67; SRI Consulting, “Diisocyanates and Polyisocyanates,” *CEH Marketing Research Report*, March 2009, at 49–50. Data are for 1999.

10% of Western European and US exports, respectively.<sup>316</sup> Over half of US polyols exports and 25% of Western Europe's polyols exports went to Asia.<sup>317</sup> Because substantial amounts of both Western European and US TDI, MDI, and polyols went to Asia, Western European and US prices would necessarily be related. Therefore, had defendants' conspiracy substantially elevated prices in Europe during 1994 through 1998, defendants' conspiracy necessarily would have increased prices in the US.

#### **5.8.4. International trade flows in raw materials for polyether polyol products**

- (226) Like polyether polyol products, major raw materials used to make these products are traded globally. The *Chemical Economic Handbook* notes that propylene oxide "is widely traded internationally from the highly concentrated production regions to other, nonproducing regions; approximately 9% of worldwide PO production is exported."<sup>318</sup> Toluene and benzene were even more widely traded—approximately 16% of toluene and 17% of worldwide benzene production were exported.<sup>319</sup>
- (227) As these raw materials are traded globally, 1994–1998 price increase letters that cited increasing raw material costs suggest increasing costs in other regions as well.<sup>320</sup>

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<sup>316</sup> SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, Feb. 2002, at 67; SRI Consulting, "Diisocyanates and Polyisocyanates," *CEH Marketing Research Report*, March 2009, at 49–50. Data are for 1999.

<sup>317</sup> SRI Consulting, "Polyether Polyols for Urethanes," *CEH Marketing Research Report*, April 1999, at 39 and 51. Data are for 1996 (US) and 1997 (Western Europe).

<sup>318</sup> SRI Consulting, "Propylene Oxide," *CEH Marketing Research Report*, Dec. 1999, at 6.

<sup>319</sup> SRI Consulting, "Toluene," *CEH Marketing Research Report*, Nov. 2003, at 5; SRI Consulting, "Benzene," *CEH Marketing Research Report*, Dec. 2007, at 6. See also Feldmann Dep. 43–44. "Raw materials—for some of the raw materials, like benzene, toluene, there is a kind of global pricing." Dr. Feldmann is on BASF's Board of Executive Directors. Feldmann Dep. 17.

<sup>320</sup> For price increase letters for TDI which cite raw material costs, see the following: August 29, 1994 (LPI\_000097775); February 24, 1995 (LPI\_000097777). For price increase letters for MDI which cite raw material costs, see the following: August 24, 1994 (BASF Corporation US 477742–43 at 42); August 25, 1994 (BASF Corporation US 477742–43 at 43); August 29, 1994 (BASF Corporation US 4445807); February 24, 1995 (HC013574567); May 30, 1995 (FSI\_000000197). For price increase letters for polyether polyols which cite raw material costs, see the following: August 30, 1994 (BASF Corporation US 477746); August 26, 1996 (LPI\_000097661); November 27, 1996 (BC/PUR0074724); December 13, 1996 (FSI\_000000196); February 28, 1997 (BC/PUR0076719).

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## **6. Econometric analysis**

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## 6.1. Introduction

(228) In this section, I describe the econometric analysis I used to estimate overcharges on Plaintiffs' purchases of TDI, MDI, and polyether polyols as a result of the Defendants' conspiracy. Overcharges reflect the extent to which prices paid by Plaintiffs were elevated (if at all) compared to the prices that would have prevailed absent the conspiracy.

(229) Conceptually, I confronted a relatively typical problem of estimating damages in a price-fixing lawsuit. I employed a standard and generally accepted approach of estimating an econometric model that removes the effect of the conspiracy on the price charged for each transaction. I chose to employ a standard econometric model, known widely in the econometric literature as "reduced form," that employs multiple regression analysis to estimate the relationship between prices and important supply and demand variables during a benchmark period untainted by the conspiracy. I used this econometric model to estimate but-for prices.

(230) This approach is well-suited to the task of estimating damages in a price-fixing lawsuit. It has been widely accepted and used by economists and accepted by the federal courts.<sup>321</sup> It has been applied in numerous areas of economic and scientific study, including the prediction of real estate prices, financial earnings, credit risk, marketing and advertising outcomes, payroll

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<sup>321</sup> *In Re Industrial Silicon Antitrust Litigation*, 1998 US Dist. LEXIS 20464 at 2 (W.D. Pa. 1998) ("There is no dispute that when used properly multiple regression analysis is one of the mainstream tools in economic study and it is an accepted method of determining damages in antitrust litigation."); *Midwest Machinery v. Northwest Airlines, Inc.*, 2001 US Dist. LEXIS 15677 at 2 (D. Minn. 2001) (and cases cited therein) ("[H]is proposed methodology, namely regression analysis, and antitrust principles are widely recognized within the field of economics and have been by courts."); *In re Polypropylene Carpet Antitrust Litigation*, 996 F. Supp. 18 (N.D. Ga. 1997), 93 F. Supp. 2d 1348 (N.D. Ga. 2000) (MDL No. 1075); *In re Potash Antitrust*, 896 F. Supp. 916 (D. Minn. 1995) (MDL No. 981); *Paper Systems, Inc. v. Mitsubishi Corp.*, 193 F.R.D. 601 (E.D. Wis. 2000), 2000 WL 362020 (E. D. Wis. 2000); *In Re DRAM Antitrust Litigation*, 608 F.Supp.2d 1166 (N. D. Cal. 2009); *In re Linerboard Antitrust Litigation*, 497 F.Supp.2d 666 (E.D.P.A. 2007); and *In re Vitamins Antitrust Litigation*, 305 F. Supp. 100 (D.D.C., 2004) (No. Misc. 99-197 (TFH) MDL 1285). See also Federal Judicial Center, *Reference Manual On Scientific Evidence*, 2d ed. (2000), 181–82 ("Multiple regression analysis is a statistical tool for understanding the relationship between two or more variables . . . Over the past several decades the use of multiple regression analysis in court has grown widely."); ABA Section of Antitrust Law, *Econometrics*, (2005) at 1–2 ("Econometrics is the application of statistical techniques and inferences to observed data in order to evaluate economic theories and their predictions . . . Private litigants, the Federal Trade Commission (FTC), and the Antitrust Division of the U.S. Department of Justice (DOJ) have used econometrics to provide evidence of the existence of a conspiracy, . . . the likelihood of anticompetitive effects, the fact of injury and the quantification of damages . . . Courts have used econometric evidence in antitrust cases for more than twenty years. One court has recognized that, '[a]s a general rule, a properly constructed regression analysis 'can play a vital role in legal proceedings. Used properly, [multiple regression] is an accurate and reliable method of determining relationships between two or more variables, and it can be a valuable tool for resolving factual disputes'''").

expenses, breast cancer, prostate cancer prognosis, and crop yields.<sup>322</sup> It is also found in the “event study” literature,<sup>323</sup> the “treatment effects” literature,<sup>324</sup> and general counterfactual studies.<sup>325</sup>

(231) To calculate Plaintiffs’ overcharges, I proceeded in two steps. First, I used the approach described above to construct econometric models of the prices of the three main commodity product categories purchased by Plaintiffs—i.e., TDI 80/20, polymeric MDI, and CFS polyols. Hereafter, I will refer to these three product categories collectively as “benchmark” product categories.

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<sup>322</sup> L. Breiman and J. H. Friedman, “Predicting Multivariate Responses in Multiple Linear Regression,” *Journal of the Royal Statistical Society* 59, Series B (1997): 3–54; Philip Brown and Clive Payne, “Election Night Forecasting,” *Journal of the Royal Statistical Society* 138, Series A (1975): 463–98 ; J. L. Callen, et al., “Neural Network Forecasting of Quarterly Accounting Earnings,” *International Journal of Forecasting* 12, no. 4 (1996): 475–82; Bruce Cooil, Russell S. Winer, and David L. Rados, “Cross-Validation for Prediction,” *Journal of Marketing Research* 24 (1987): 271–79; J.B. Copas, “Regression, Prediction and Shrinkage,” *Journal of the Royal Statistical Society* 45, Series B (1983): 311; Stephen A. De Lurgio and Fred Hays, “Predicting Microloan Defaults Using Probabilistic Neural Networks,” *The Credit and Financial Management Review* 8, no. 2 (2002); P. Hebel, et al., “Shrinkage Estimators Applied to Prediction of French Winter Wheat Yield,” *Biometrics* 49 (1993): 281–93; J. P. Lesage and M. Magura, “Using Bayesian Techniques for Data Pooling in Regional Payroll Forecasting,” *Journal of Business and Economic Statistic* 8, no. 2 (1990): 127–35; D. B. Lobell, K. N. Cahill and C. B. Field, “Weather-based Yield Forecasts Developed for 12 California Crops,” *California Agriculture*, 2006, 211–15; A.W. Partin, et al., “Combination of Prostate-specific Antigen, Clinical Stage, and Gleason Score to Predict Pathological Stage of Localized Prostate Cancer: A Multi-institutional Update,” *Journal of the American Medical Association* 277, no. 18 (1997): 1445–51; P. Sharma, et al., “Early Detection of Breast Cancer Based on Gene Expression Patterns in Peripheral Blood Cells,” *Breast Cancer Research* 7, no. 5 (2005): R634–44; Joel H. Steckel and Wilfried R. Vanhonacker, “12 Cross-Validating Regression Models in Marketing Research,” *Marketing Science*, 1993, 415–27.

<sup>323</sup> The event study literature evaluates the effect that some given economic event has on an item of interest. For example, the difference between an actual and an estimated stock price could provide an estimate of the impact of an important news release on a stock price. For early contributions in the event study literature, see James Clay Dolley, “Characteristics and Procedure of Common Stock Split-Ups,” *Harvard Business Review* 11, no. 3 (1933): 316–27; E. Fama, L. Fisher, M. Jensen, and R. Roll, “The Adjustment of Stock Prices to New Information,” *International Economic Review* 10, no. 1 (1969): 1–21; Ray Ball and Philip Brown, “An Empirical Evaluation of Accounting Income Numbers,” *Journal of Accounting Research*, Autumn 1968, 159–78. For a survey, see A. Craig MacKinlay, “Event Studies in Economics and Finance,” *Journal of Economic Literature* 35, no. 1 (1997): 13–39.

<sup>324</sup> The treatment effects literature evaluates the effect that some given social policy, action, or intervention has on an item of interest. For example, randomness in military draft lottery outcomes could be used to estimate the impact of military service on post-military earnings. For a survey of treatment effect studies in labor markets, see J. Heckman, R. LaLonde, and J. Smith, “The Economics and Econometrics of Active Labor Market Programs,” in *Handbook of Labor Economics* 3, ch. 31, 1865–2097 (Amsterdam: Elsevier, 1999); and J. Angrist, and Krueger, “Empirical Strategies in Labor Economics,” in *Handbook of Labor Economics* 3, ch. 23, 1277–1366 (Amsterdam: Elsevier, 1999).

<sup>325</sup> See, e.g., Alberto Abadie, and Javier Gardeazabal, “The Economic Costs of Conflict: A Case-Control Study for the Basque Country,” *The American Economic Review* 93, no. 1 (2003): 113–32 (effect of terrorism on GDP), William J. Collins, “Race, Roosevelt, and Wartime Production: Fair Employment in World War II Labor Markets,” *The American Economic Review* 91, no. 1. (2001): 272–86 (effect of discrimination on unemployment rates).

(232) Second, I employed regression analysis to determine the relationship between the prices of each individual product and the prices of the appropriate benchmark product category. More precisely, for each product purchased by Plaintiffs I regressed the individual transaction prices of the product on the prices of the corresponding benchmark product category—i.e., I regressed prices of TDI products on TDI 80/20 prices, the prices of MDI products on polymeric MDI prices, and the prices of polyol products on CFS polyols prices. For products whose prices exhibited a systematic relationship over time to the prices of the associated benchmark product category, I calculated overcharges by using the regression equation to estimate a but-for price for every transaction. For products whose prices did not exhibit a systematic relationship to the prices of the associated benchmark product category, I calculated overcharges based upon overcharges in comparable transactions.

(233) I relied on a two-step approach because this allows me to systematically account for the variety of products purchased and purchasing arrangements across Plaintiffs and Defendants. My two-step approach allows for the possibility that different products' prices were raised by different amounts, while at the same time making use of the common factors driving prices. The use of two-step estimation procedures is well known in the scientific literature, and it has been accepted by the federal courts.<sup>326</sup>

(234) The remainder of this section is organized as follows. Section 6.2 addresses my choice of the benchmark period used to estimate my model. Section 6.3 describes the supply and demand variables accounted for in my model. Section 6.4 discusses limitations of the available sales data. Section 6.5 describes how I estimated but-for prices for the benchmark product categories. Section 6.6 describes how I estimated the but-for prices for individual TDI, MDI, and polyol products. Section 6.7 presents the overcharges that I calculated.

## 6.2. Selection of the benchmark period

(235) When a benchmark period is used to estimate what prices would have prevailed in the absence of a conspiracy, careful consideration should be given to selecting a benchmark

<sup>326</sup> Two-step approaches like the one I adopted here were employed in *In Re Vitamins Antitrust Litigation*, in *In Re Linerboard Antitrust Litigation*, and in *In Re DRAM Antitrust Litigation*, and they were, in all cases, accepted by the courts as reliable methods. See, e.g., Expert Report of D. Bernheim at 169, 170, 180, 182, submitted on May 24, 2002, in the matter of *In Re Vitamins Antitrust Litigation*; see also *In Re DRAM Antitrust Litigation*, 608 F.Supp.2d 1166 (N. D. Cal. 2009), where Judge P.J. Hamilton ruled that “[a] two step forecasting method has been used to predict international countries' growth rates, real interest rates, GDP rates, as well as other economic factors. [ . . . ]. Dr. White's use of the second step, far from being undertaken in some unscientific manner, is explained as a means of *increasing* reliability.” (emphasis in original)

period that is untainted by the conspiracy. Otherwise, the use of data from a time period when the conspiracy was in effect can cause the model to underestimate the impact of the conspiracy on price. This point has been widely recognized.<sup>327</sup>

(236) As noted above, Counsel asked me to calculate overcharges over two periods:

- the conspiracy period, January 1994 to December 2003;
- the class period, January 1999 to December 2003.

(237) In the first case, I naturally excluded the assumed conspiracy period of January 1994 through December 2003 from my benchmark period.

(238) In the second case, I naturally excluded January 1999 through December 2003 from my benchmark period. I excluded 1999 to 2003 because I was asked to calculate overcharges in that period under the assumption a conspiracy was in effect then. In addition, I excluded data from the period January 1994 through December 1998, because, as discussed in sections 5.7 and 5.8, the evidence and information available to me indicated that a conspiracy affected US prices during that time period.

(239) My benchmark period for both cases therefore covered seven years—January 1992 through December 1993 and January 2004 through December 2008—and did not contain data from the period 1994 through 1998.

### 6.3. Supply and demand variables

(240) In estimating my benchmark product category models, I accounted for a wide range of supply variables including the specific costs of widely-traded raw materials (toluene, benzene, propylene, chlorine, ethylene, methanol, ammonia, and natural gas) and a US wage index for chemical industry workers. I also accounted for important demand variables that comprised major components of demand for polyurethane products, including measures of industrial

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<sup>327</sup> The before-and-after method “is premised on the assumption that prices before and after, but not during, the period were set free of any illegal cartelization.” *Proving Antitrust Damages: Legal and Economic Issues*, 2nd Edition, American Bar Association, April 10, 2010 at 202. See also 210 (“Because the designation of the beginning and ending dates of the conspiracy is so important, courts have been careful to ensure that they are chosen based on the evidence or well-established economic theory.”)

In *In re: Linerboard Antitrust Litigation*, United States District Court Judge DuBois carefully considered this issue and concluded that “if there was in fact collusion during the benchmark period, [the expert’s] but-for price estimate would be too high, causing his estimate of the overcharge (the difference between actual prices and but-for prices) to be too low.” *In re Linerboard Antitrust Litigation*, 497 F.Supp.2d 666 (E.D.P.A. 2007).

production in relevant segments, motor vehicle assemblies, and housing starts. I also accounted for macroeconomic and international influences on supply and demand including US dollar exchange rates (against the Euro and Canadian dollar) and US interest rates. Finally, I also accounted for the impact of Hurricanes Katrina and Rita in 2005 as well as the structural change in the industry that occurred in 2005, i.e., the large reduction in TDI capacity and the fall in the number of TDI suppliers from five to three.

- (241) An important consideration is that the selection of supply and demand variables for my econometric models was guided by the general principle that these variables should not be potentially affected by the conspiracy. This principle is well-known in the field of econometrics,<sup>328</sup> and has been recognized by federal courts.<sup>329</sup>
- (242) Accordingly, I have excluded from my models all variables that would be potentially affected by Defendants' conspiracy.
- (243) I understand certain Plaintiffs ("foamers") are alleged to have participated in a price-fixing conspiracy for urethane foams. I also understand the foamers' conspiracy is alleged to have started before 1992 and continued past 2008.<sup>330</sup> Because the foamers' conspiracy is alleged to have operated during the benchmark period, my model appropriately accounts for any impact, if any, the alleged foamers' conspiracy had on the price of TDI, MDI, and polyether polyols.
- (244) Section 6.3.1 provides a summary of the supply and demand variables used in my analysis. Sections 6.3.2 to 6.3.8 describe the supply and demand variables used in my analysis.

### **6.3.1. Overview of supply and demand variables**

- (245) Figure 44 lists the variables I identified as potential supply and demand variables related to the prices of the benchmark product categories: TDI 80/20, polymeric MDI, and CFS polyols.

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<sup>328</sup> A literature review is provided in H. White, "Time-Series Estimation of the Effects of Natural Experiments," 135 *Journal of Econometrics* 527-66 (2005). This insight also is developed in a body of statistical and econometric research commonly referred to as the "treatment effects" literature. J. Angrist and A. Krueger, "Empirical Strategies in Labor Economics," in *Handbook of Labor Economics*, vol. 3A, 1277-368 (Elsevier: Amsterdam, 1999); P. Rosenbaum and D. Rubin, "The Central Role of the Propensity Score in Observational Studies for Causal Effects," *Biometrika* 70 (1983): 41-55; D. Rubin, "Estimating Causal Effects of Treatments in Randomized and Non-Randomized Studies," *Journal of Educational Psychology* 66, (1975): 688-701.

<sup>329</sup> See, e.g., *In re Linerboard Antitrust Litigation*, 497 F.Supp.2d 666 (E.D.P.A. 2007) and *In Re DRAM Antitrust Litigation*, 608 F.Supp.2d 1166 (N. D. Cal. 2009).

<sup>330</sup> Declaration of Charles Miller, September 30, 2010.

Figure 44 also illustrates which supply and demand variables applied to each benchmark product category.

**Figure 44 Supply and demand variables for each benchmark product category**

Variable	TDI 80/20	Polymeric MDI	CFS Polyols
Toluene	X		
Benzene		X	
Propylene			X
Ammonia	X	X	
Chlorine	X	X	
Ethylene			X
Methanol		X	
Natural gas	X	X	X
Wages	X	X	X
US carpeting & furniture IPI	X		X
US appliances, carpeting, & furniture IPI		X	
US motor vehicle assemblies	X		X
US housing starts		X	
10-year Treasury constant maturity rate	X	X	X
US-Euro exchange rate	X	X	X
US-Canada exchange rate	X	X	X
Hurricanes Katrina/Rita	X	X	X
Post-2005 variables	X	X	X

(246) Figure 44 indicates how raw materials costs are accounted for across the three benchmark product categories. For TDI 80/20 prices, I accounted for the costs of toluene, chlorine, ammonia, and natural gas. For polymeric MDI prices, I accounted for the costs of benzene, chlorine, methanol, ammonia, and natural gas. For CFS polyols prices, I accounted for propylene and ethylene, plus natural gas (as a source of energy). Figure 22 supports my decision to account for these raw materials costs.

(247) Figure 44 also shows how I accounted for demand across the three products. For example, I accounted for carpeting and furniture production in the prices of TDI 80/20 and CFS polyols, but I accounted for appliances, carpeting, and furniture production in the prices of polymeric MDI. I made this distinction because the rigid foam produced by polymeric MDI (and non-CFS polyols) is used to insulate appliances such as refrigerators, while the flexible foam produced by TDI 80/20 and CFS polyols is typically not.<sup>331</sup> Similarly, I accounted for motor

<sup>331</sup> See *infra* ¶¶ (80), (90)–(94).

vehicle assemblies in the prices of TDI 80/20 and CFS polyols because the foam used in motor vehicle assemblies is primarily flexible foam.<sup>332</sup> Finally, I accounted for housing starts in the prices of polymeric MDI because polymeric MDI is used as a binder for oriented strand board.<sup>333</sup>

(248) Finally, Figure 44 demonstrates that I accounted for other variables in the prices of all three products. These include wages, interest rates, exchange rates, Hurricanes Katrina and Rita, and TDI closures in 2005.

### **6.3.2. Feedstock inputs**

(249) I accounted for feedstock costs by using prices for toluene, benzene, propylene, ammonia (a proxy for nitric acid), chlorine, ethylene, methanol (a proxy for formaldehyde), and natural gas (a proxy for carbon monoxide and hydrogen, and also a source of energy). With the exception of ammonia, these chemicals are all shown in Figure 22, which describes the production process.<sup>334</sup>

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<sup>332</sup> See *infra* ¶ (94).

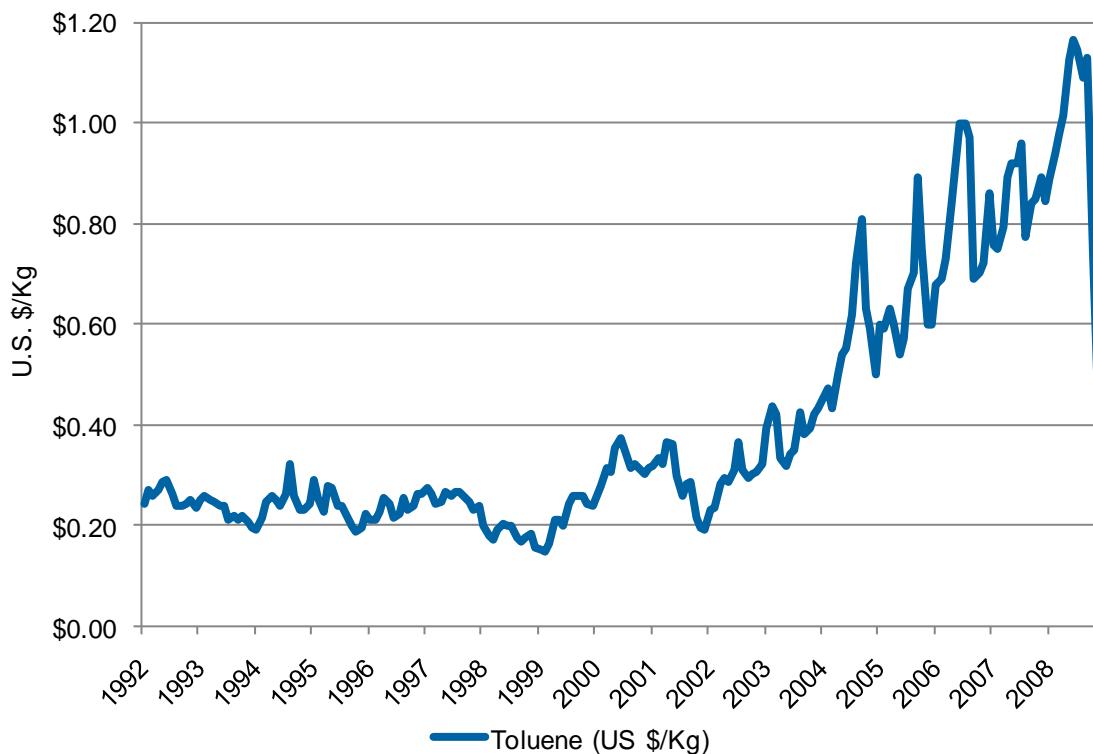
<sup>333</sup> See *infra* ¶ (56).

<sup>334</sup> As discussed below, ammonia is the major feedstock chemical for nitric acid, and ammonia is widely traded with reported market prices, whereas nitric acid is not. See *infra* ¶ (253).

### 6.3.2.1. Toluene

(250) I accounted for the cost of toluene by using the toluene price series reported weekly by ICIS-LOR for C grade toluene priced in the US Gulf. I constructed a monthly toluene series by taking the average of weekly prices within a month. The resulting series is graphed in Figure 45.

**Figure 45 US toluene prices**

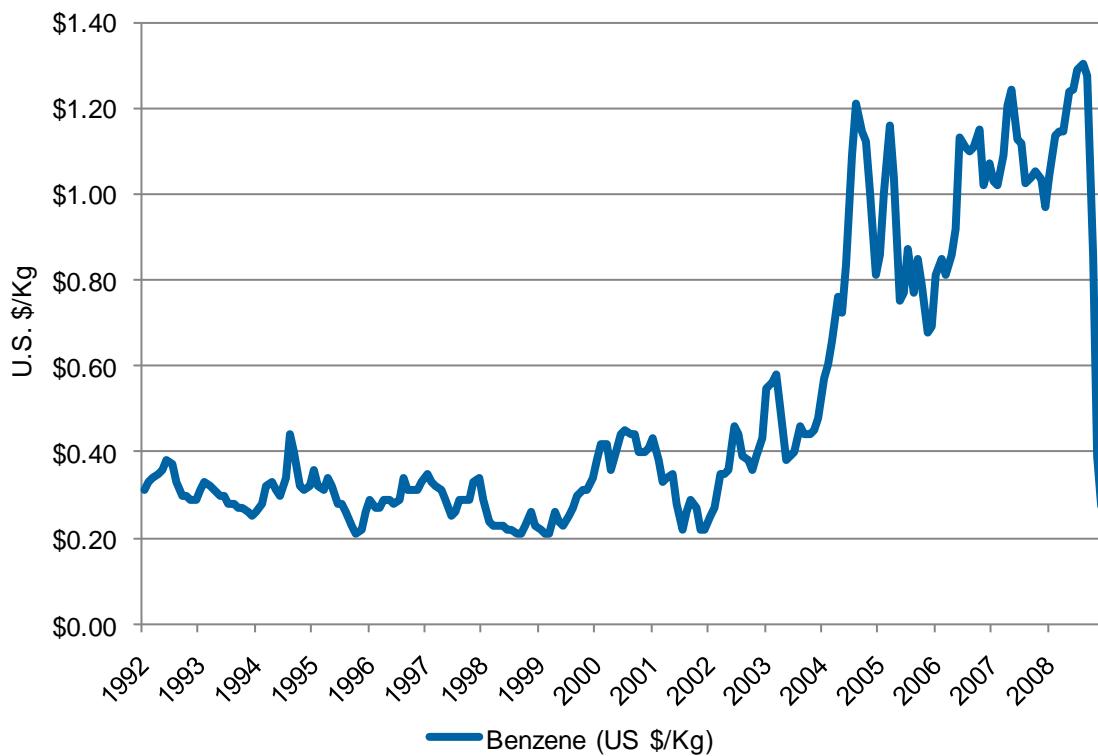


Source: ICIS-LOR, Toluene (C Grade, In US Gulf Spot FOB Barges)

### 6.3.2.2. Benzene

(251) I accounted for the cost of benzene by using the benzene price series reported weekly by ICIS-LOR for benzene priced in the US Gulf. I constructed a monthly benzene series by taking the average of weekly prices within a month. The resulting series is graphed in Figure 46.

**Figure 46 US benzene prices**

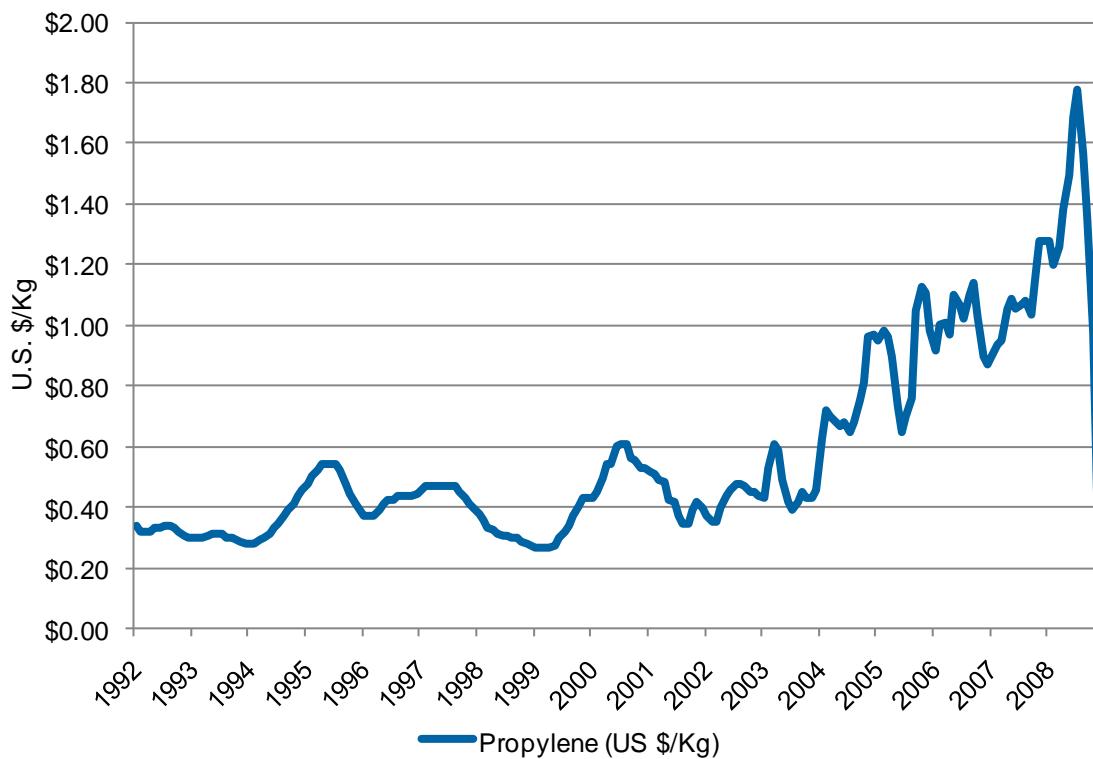


Source: ICIS-LOR, Benzene (In US Gulf Spot FOB Barges)

### 6.3.2.3. Propylene

(252) I accounted for the cost of propylene by using the propylene price series reported weekly by ICIS-LOR for C grade propylene priced in the US Gulf. I constructed a monthly propylene series by taking the average of weekly prices within a month. The resulting series is graphed in Figure 47.

**Figure 47 US propylene prices**

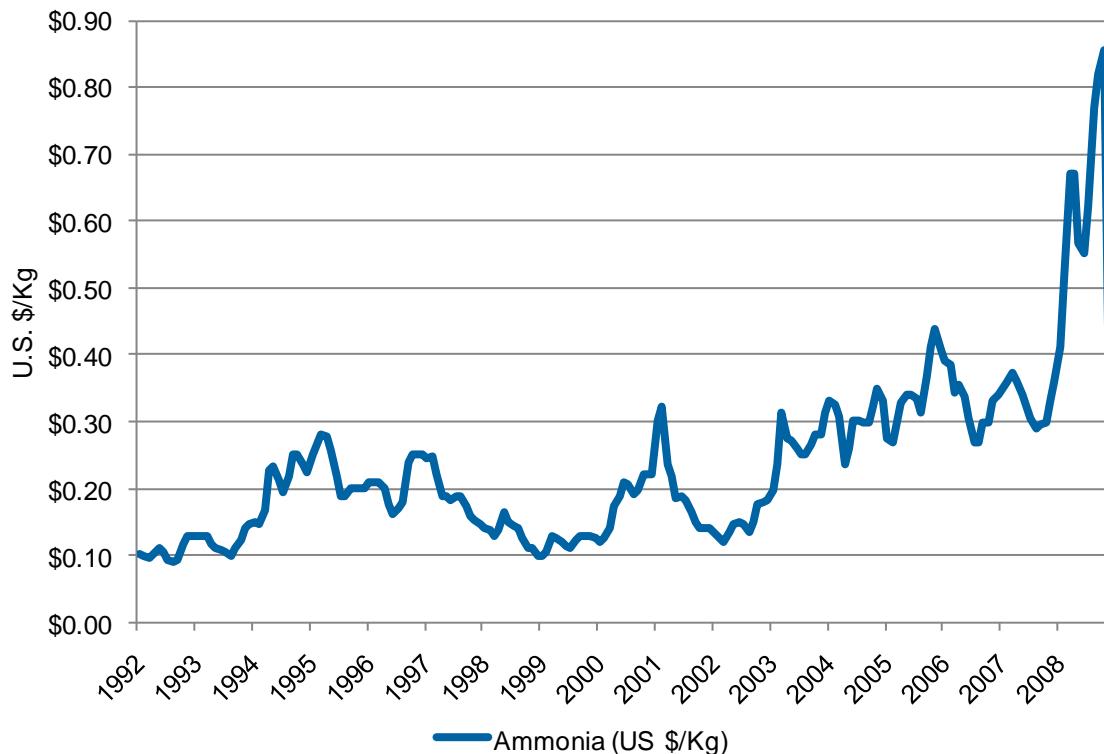


Source: ICIS-LOR, Propylene (C Grade, In US Gulf Spot Pipeline)

### 6.3.2.4. Ammonia

(253) I accounted for the cost of nitric acid by using the ammonia price series reported weekly by ICIS-LOR for ammonia prices in the US Gulf. I used the price of ammonia as a “proxy” for nitric acid, because ammonia is the major feedstock chemical for nitric acid, and ammonia is widely traded with reported market prices, whereas nitric acid is not.<sup>335</sup> I constructed a monthly ammonia series by taking the average of weekly prices within a month. The resulting series is graphed in Figure 48.

**Figure 48 US ammonia prices**



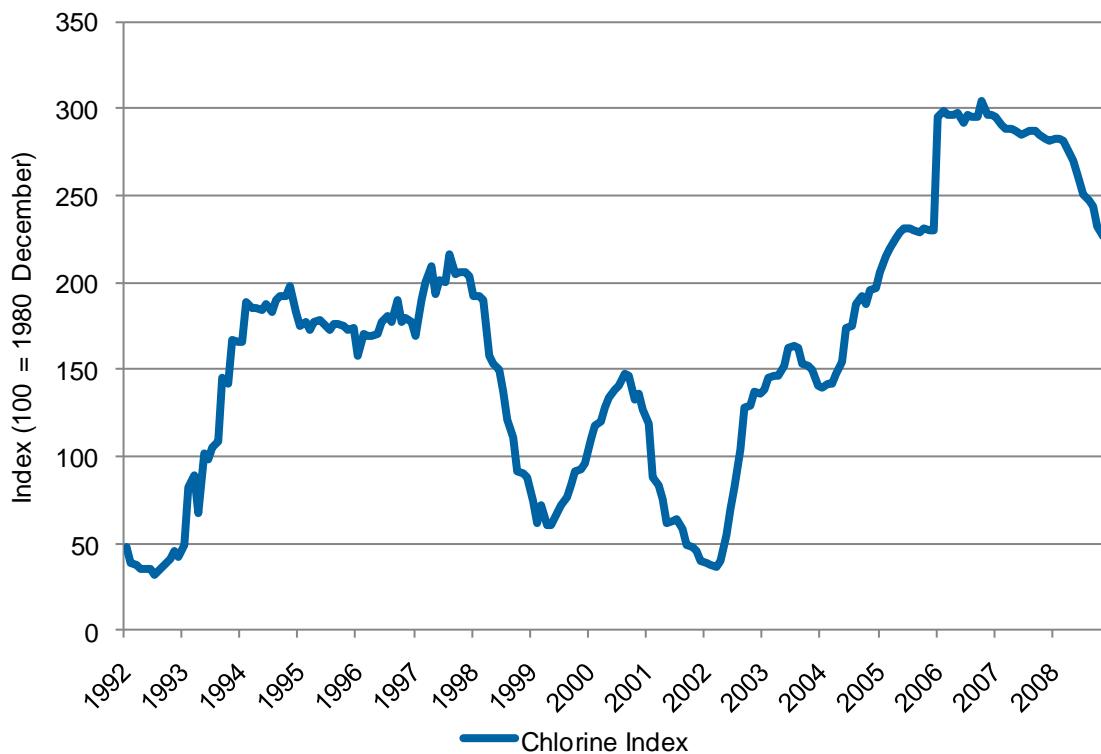
Source: ICIS-LOR, Ammonia (In US Gulf Spot FOB USG)

<sup>335</sup> See, e.g., Sept. 22, 2003, *Isocyanate Raw Materials: Nitric Acid*, BCC 0239845–899. “Worldwide the nitric acid producers are utilizing their main production capacities for fertilizers. Due to the integration of the nitric acid in the fertilizer production, there is no real nitric acid market established so far” (at 55). “[T]he nitric acid price highly depends on the local ammonia market prices” (at 58). There is a spot market for ammonia (at 58). Ammonia is traded globally (at 59). See also April 22, 2002, *Isocyanate Raw Material Contracts*, BCC 0188755–790. “About half of the nitric acid price depend [sic] on the local ammonia price” (at 68).

### 6.3.2.5. Chlorine

(254) I accounted for the cost of chlorine by using the chlorine PPI reported monthly by the Bureau of Labor Statistics (BLS) for compressed or liquefied chlorine. The resulting series is graphed in Figure 49.

**Figure 49 US chlorine index**

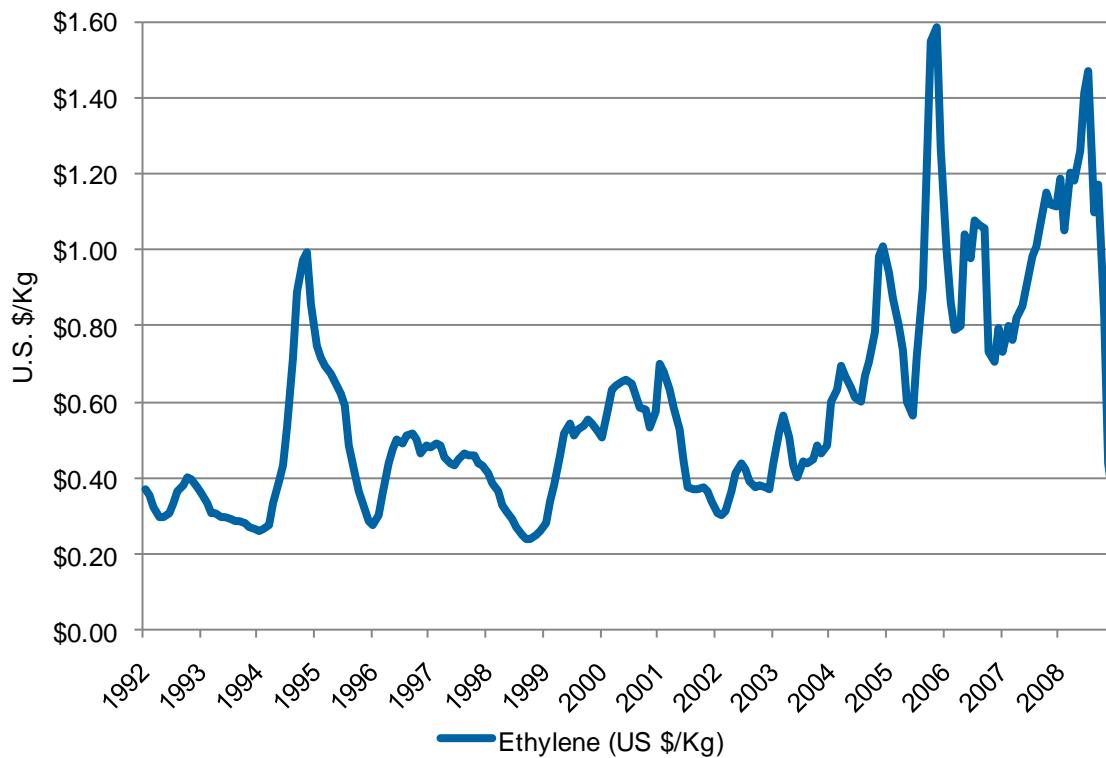


Source: BLS, Chlorine Index (Compressed or Liquefied)

### 6.3.2.6. Ethylene

(255) I accounted for the cost of ethylene by using the ethylene price series reported weekly for ethylene priced in the US Gulf. I constructed a monthly ethylene series by taking the average of weekly prices within a month. The resulting series is graphed in Figure 50.

**Figure 50 US ethylene prices**

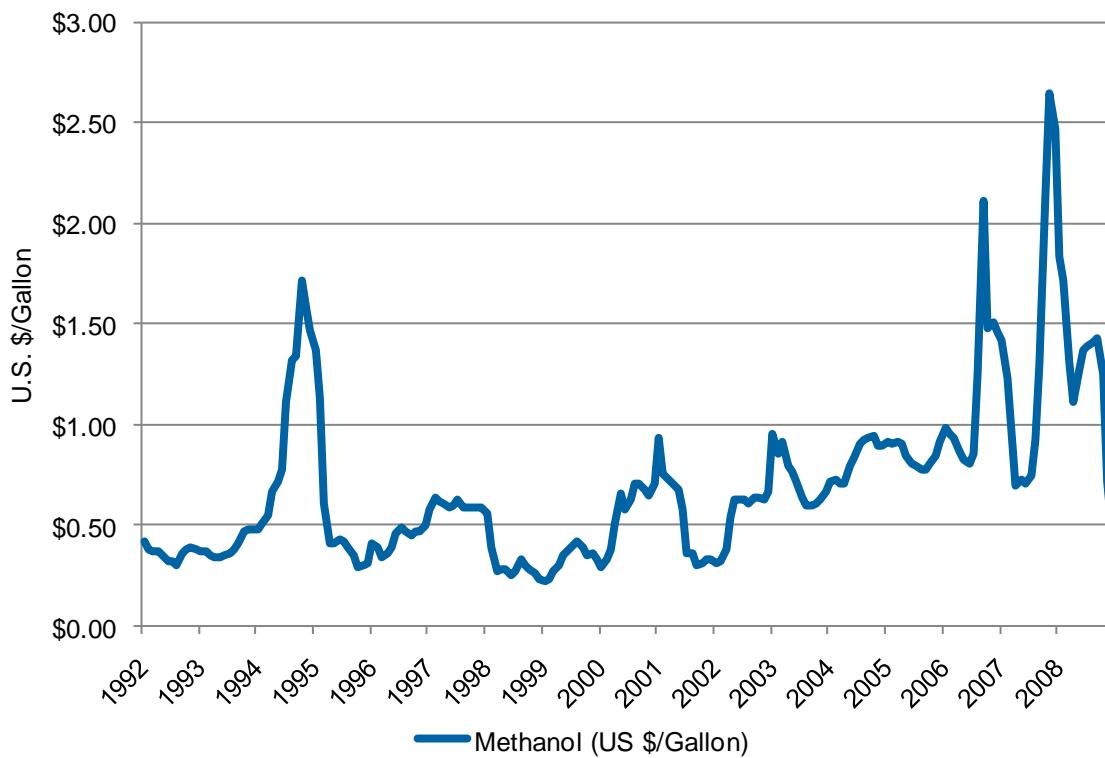


Source: ICIS-LOR, Ethylene (In US Gulf Spot Del Pipeline)

### 6.3.2.7. Methanol

(256) I accounted for the cost of formaldehyde by using the methanol price series reported weekly by ICIS-LOR for methanol priced in the US Gulf. Formaldehyde prices are related to methanol prices, because formaldehyde is derived from methanol.<sup>336</sup> I constructed a monthly methanol series by taking the average of weekly prices within a month. The resulting series is graphed in Figure 51.

**Figure 51 US methanol prices**



Source: ICIS-LOR, Methanol (In US Gulf Spot DOM Barge)

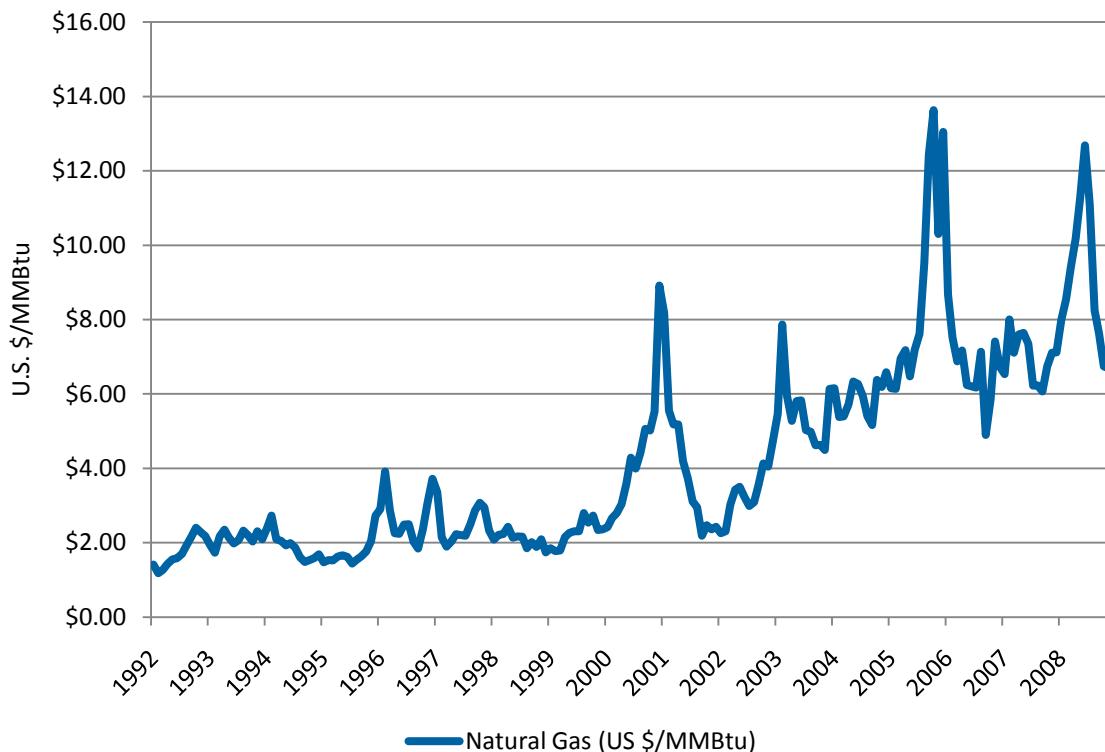
<sup>336</sup> See April 22, 2002, *Isocyanate Raw Material Contracts*, BCC 0188755–790. “Typically, about 50% of the formaldehyde price results from the methanol price” (at 81).

“Major raw material for formaldehyde production is methanol.” BC/PUR0450189–223 at 203.

### 6.3.2.8. Natural gas

(257) Figure 22 shows a step in the production of TDI and MDI called “hydrogenation,” as well as the use of carbon monoxide (CO). Natural gas is converted into both hydrogen and carbon monoxide as part of the TDI and MDI production processes.<sup>337</sup> To the extent that natural gas is also an energy source for the production processes of TDI, MDI, and polyols, I accounted for that as well.<sup>338</sup> I did so by using the monthly average of daily prices of Henry Hub natural gas.<sup>339</sup> The natural gas series is shown in Figure 52.

**Figure 52 US natural gas prices**



Source: Bloomberg, US Henry Hub Natural Gas Price

<sup>337</sup> Tecnon OrbiChem, *TDI World Study 1998–2010*, BC/PURO293633–715 at 639, 641; Tecnon OrbiChem, *MDI World Study 1998–2010*, BASF Corporation US 1128261–352 at 269, 272.

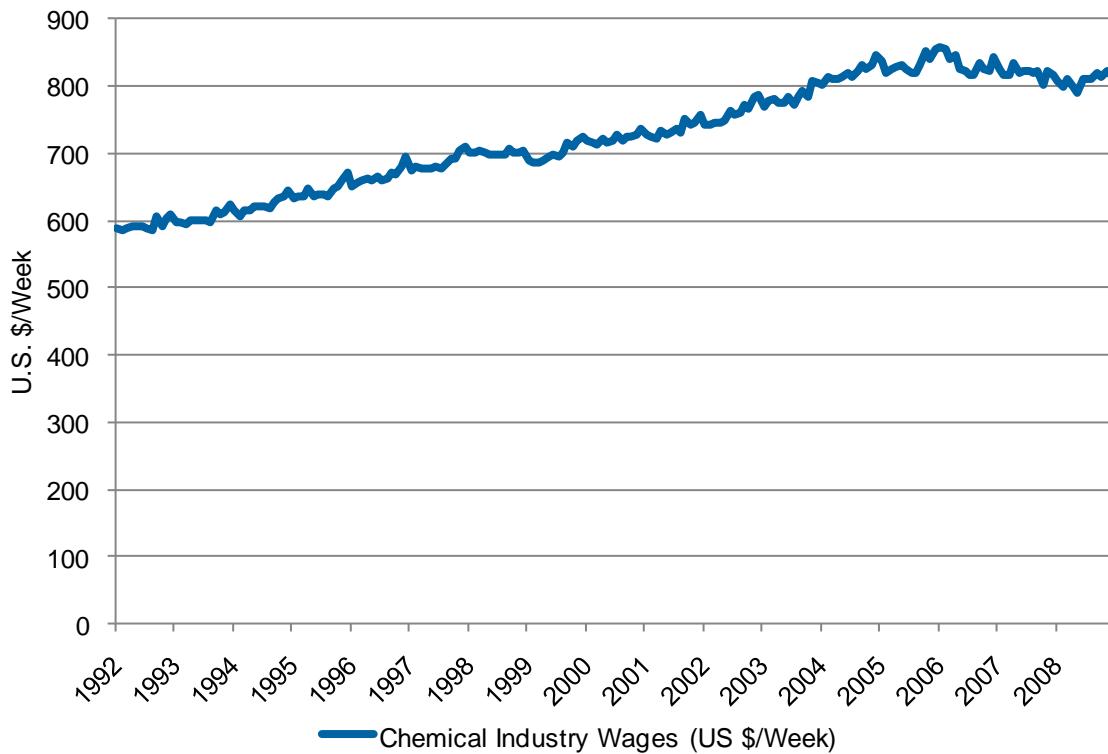
<sup>338</sup> “Natural gas prices not only influence raw material costs, but also operating costs, as producers use natural gas for energy to run their facilities and operations.” BASF Corporation US 638542–543 at 42 (October 31, 2005, *Chemical Marketing Reporter*).

<sup>339</sup> Henry Hub prices are referred to as the “benchmark” natural gas price by the American Chemistry Council. See, e.g., American Chemistry Council, *Weekly Chemistry and Economic Trends*, February 27, 2004, BASF Corporation US 164353–58 at 54.

### 6.3.3. Wages

(258) I accounted for labor costs by using the Average Hourly Earnings of Production Chemical Workers reported by the US Bureau of Labor Statistics (BLS). This series is available monthly, and it is graphed in Figure 53.

**Figure 53 US chemical industry wages**



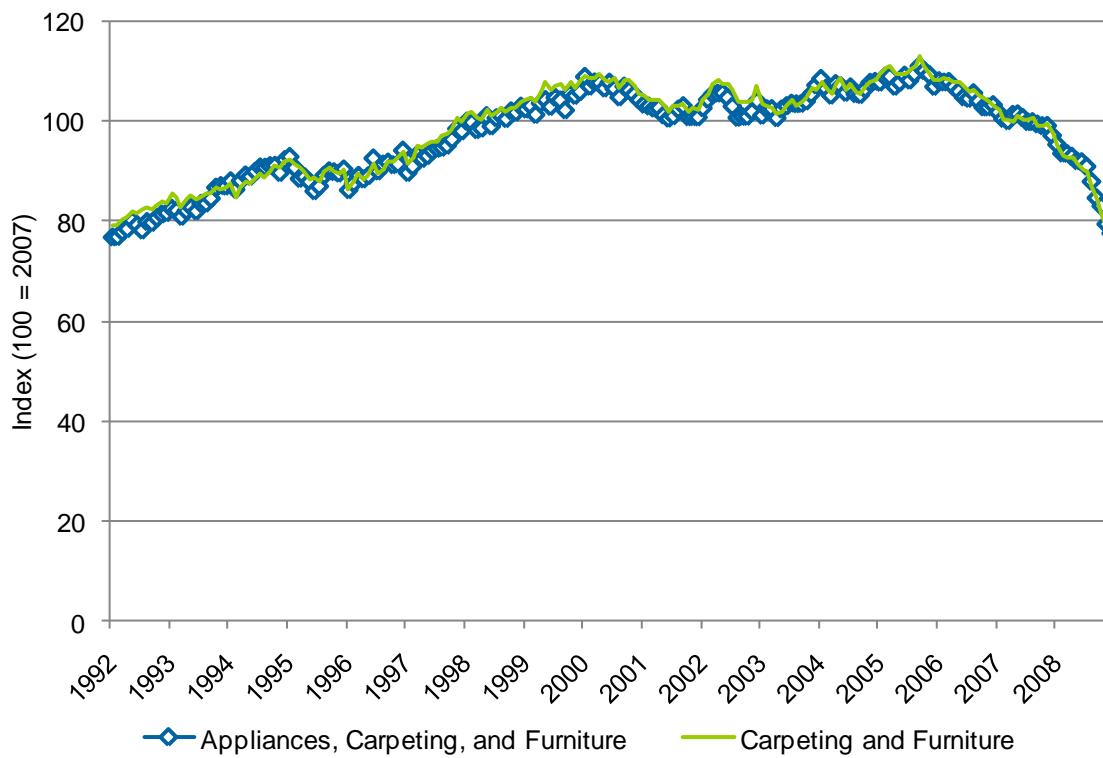
Source: BLS, Average Weekly Earnings for Production and Non-Supervisory Employees in the Chemical Manufacturing Industry

### 6.3.4. Demand variables

(259) I accounted for important demand variables by using key downstream drivers of demand for polyether polyol products that were sufficiently broad to have been unaffected by the conspiracy. These demand measures included

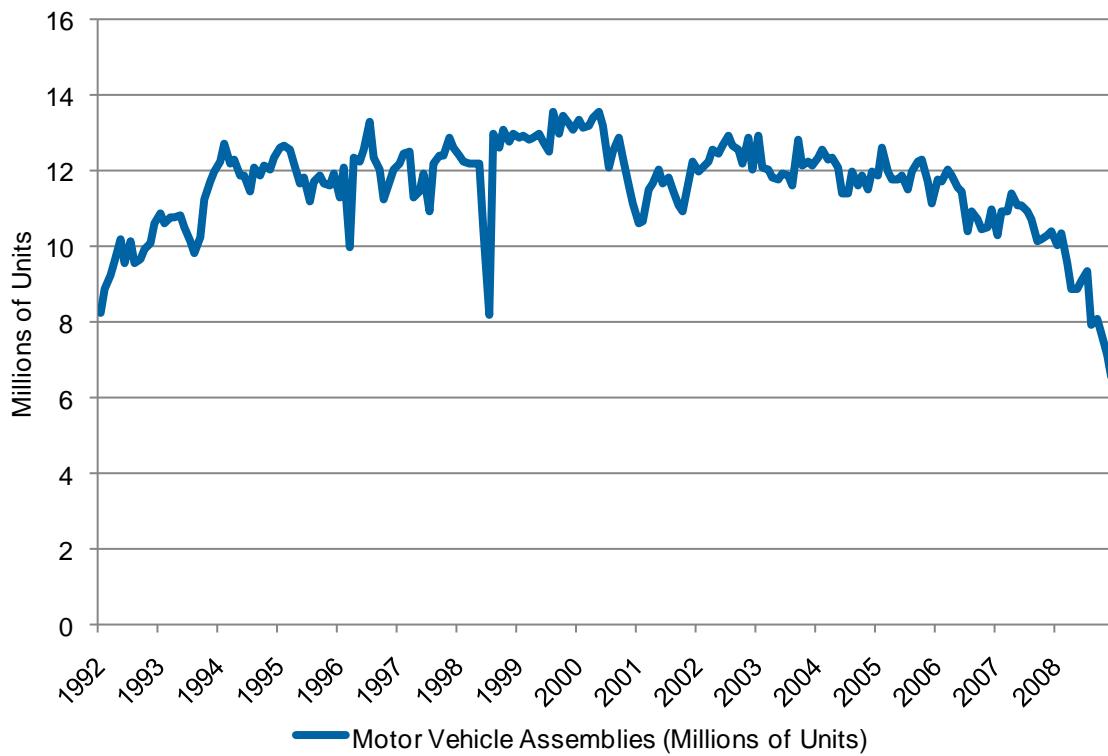
- industrial production indices reported by the Federal Reserve Board for appliances, carpeting and furniture, and for carpeting and furniture alone (depicted in Figure 54);
- total motor vehicle assemblies reported by the Federal Reserve Board (depicted in Figure 55); and
- new privately owned housing units started, as reported by the Census Bureau (depicted in Figure 56).

**Figure 54 US domestic industrial production indices**



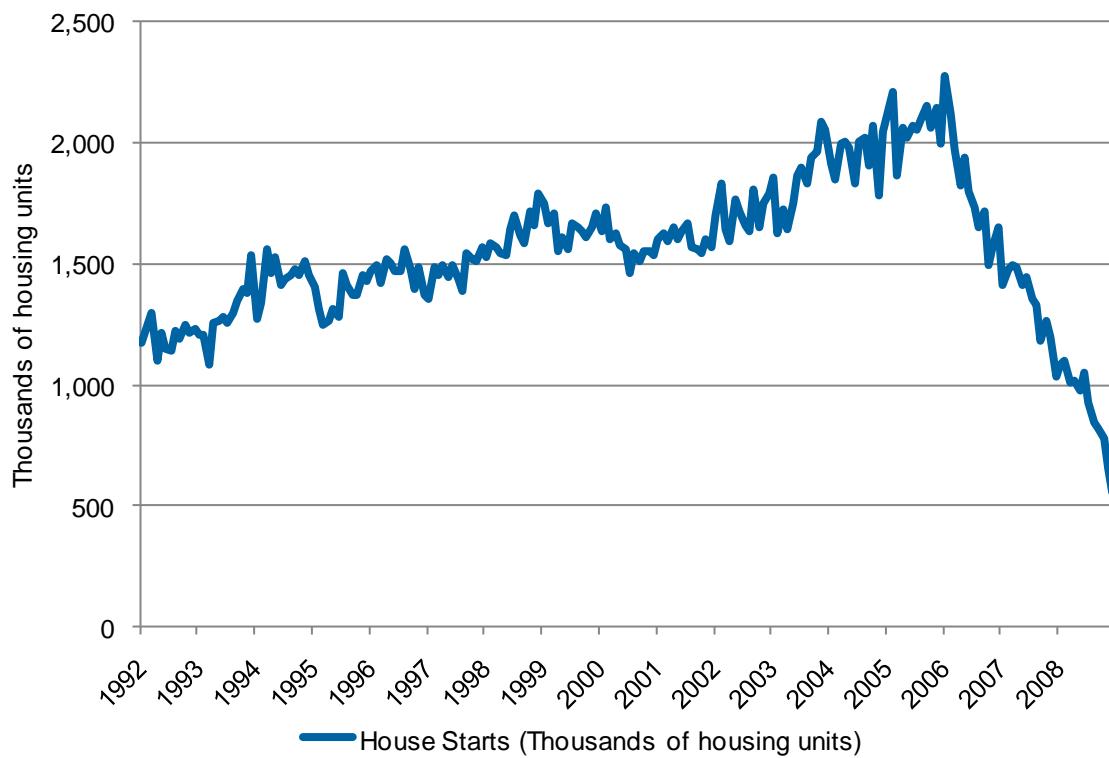
Source: Federal Reserve

**Figure 55 US motor vehicle assemblies**



Source: Federal Reserve

Figure 56 US housing starts

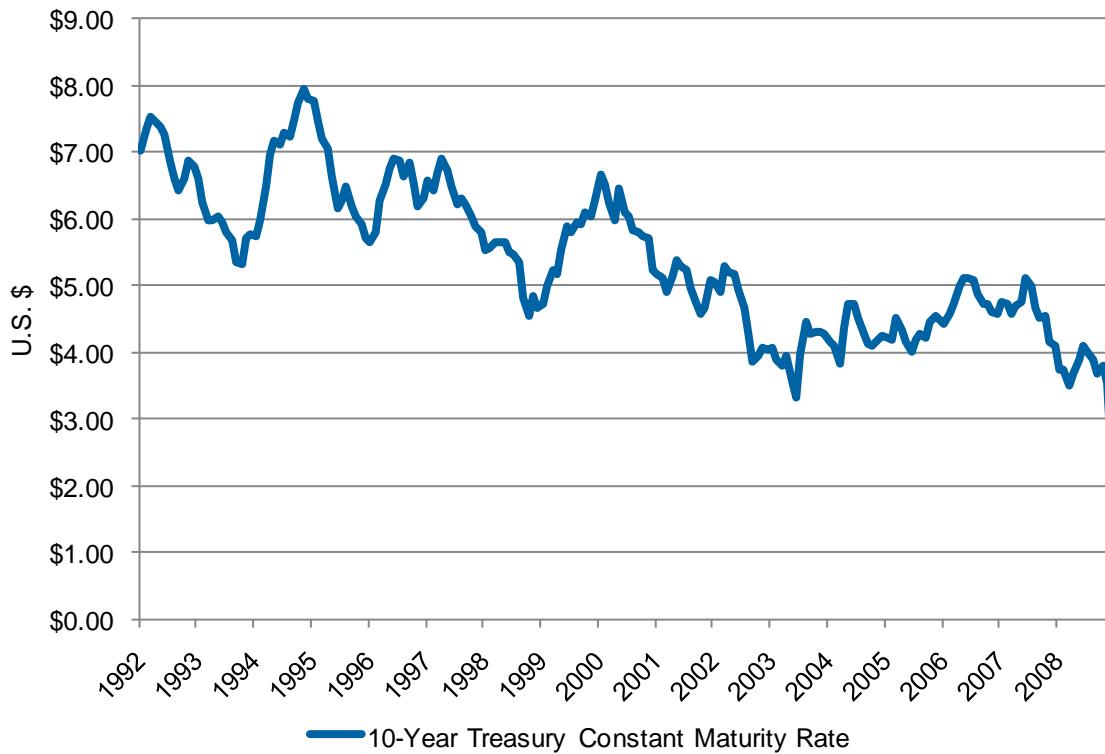


Source: US Census Bureau

### 6.3.5. Interest rates

(260) Interest rates can affect both the demand and supply of polyether polyol products. I accounted for interest rates by using the 10-year Treasury Constant Maturity Rate, as reported monthly by the Federal Reserve. This interest rate is depicted in Figure 57.

**Figure 57 Ten-year treasury constant maturity rate**

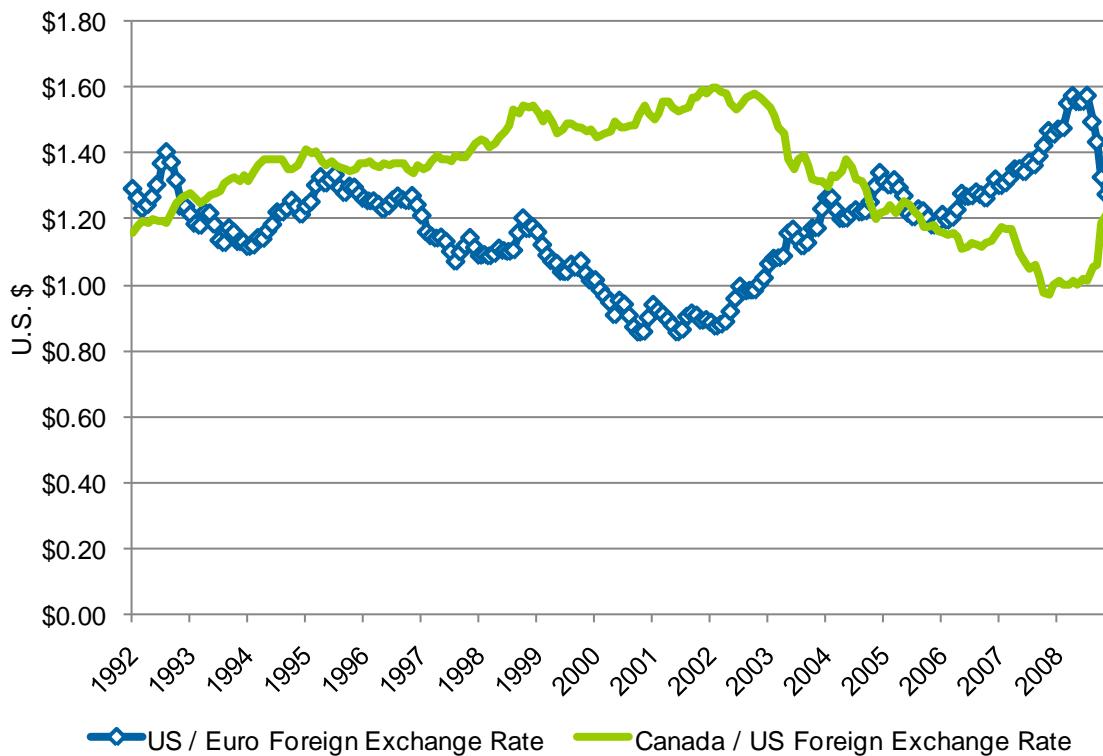


Source: Federal Reserve

### 6.3.6. Foreign exchange rates

(261) Like interest rates, foreign exchange rates can affect both the demand and supply of polyether polyol products. I accounted for foreign exchange rates by using the US dollar exchange rates against the European Euro and the Canadian dollar. The Federal Reserve publishes these series monthly. They are reported in Figure 58.

**Figure 58 Foreign exchange rates**



Source: Federal Reserve

### 6.3.7. Hurricanes Katrina and Rita

(262) As discussed above, Hurricanes Katrina and Rita significantly impacted the industry, impairing production and distribution capacity, and affecting prices and production for four to

six months.<sup>340</sup> I included variables to account for these hurricanes in my econometric model.<sup>341</sup>

(263) I recognized that other hurricanes occurred during 1992-2008. Although there is evidence that they too may have affected business conditions for TDI, MDI, and polyether polyols, no other hurricane appeared to cause their prices to significantly rise for an extended period of time, or had such documented impact.<sup>342</sup>

### 6.3.8. Post-2005 industry changes

(264) As described in section 5.6.1, Bayer, Huntsman, and Lyondell permanently closed 34% of US TDI capacity, and Huntsman and Lyondell exited the TDI business in 2005. Although there had been earlier consolidation in the industry, that consolidation affected less market share, occurred more gradually over time, and resulted in either no or only marginal changes in capacity.

(265) The large reduction in capacity and in the number of suppliers in 2005 likely changed pricing in the industry. I included variables to account for this structural change in my econometric analysis.

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<sup>340</sup> See *infra* ¶ (194).

<sup>341</sup> Specifically, I included dummy variables. Dummy variables are a standard method used to account for discrete changes in pricing relationships over time. See, e.g., William Greene, *Econometric Analysis*, 3d ed. (Upper Saddle River, NJ: Prentice Hall, 1997), 379. “One of the most useful devices in regression analysis is the binary, or **dummy**, variable . . . binary variables are also a convenient means of building discrete shifts of the function into a regression model” (emphasis in original).

For example, in his study of a 1880-1886 railroad cartel, Professor Robert Porter estimated a price equation that included two dummy variables to account for two separate episodes of entry, one dummy variable to account for an episode of capacity expansion, and one dummy variable to account for an exit (from the cartel, not the industry). Robert Porter, “A Study of Cartel Stability: The Joint Executive Committee, 1880-1886,” *Bell Journal of Economics* 14, no. 2 (1983): 301-14. See tables 1 and 3. Porter includes other dummy variables as well: dummy variables for the month of the year and for whether the Great Lakes were open or frozen (as shipping across the Great Lakes represented the primary competition to the railroad).

<sup>342</sup> See, e.g., Huntsman International LLC’s Objections and Answers to the Direct Action Plaintiffs’ Second Set of Interrogatories Directed to all Defendants Exhibit A, Table 5, Aug. 2, 2010 (showing production outages that were a result of hurricanes in 1992 and 2008) and *id.* at 44 (noting that Hurricane Gustav caused Huntsman to use sales allocation roughly lasting for the month of September 2008); Bayer website, “Update on Hurricane Ike’s Effect on BMS Texas Facilities,” <http://www.polymers.usa.bayer.com/news/index.cfm?mode=detail&id=66508CF8-D8F0-753F-0FE66E33CB33BB9E>, accessed on April 12, 2011 (describing a force majeure in polyether polyol products lasting from mid-September to mid-October 2008 as a result of Hurricane Ike).

## 6.4. Defendant sales data considerations

(266) While a lot of data was made available to me for damages estimation, the data sample had some limitations that I had to address.

(267) Generally, I had access to disaggregated data produced by Defendants through discovery on specific transactions between Defendants and their customers, including Plaintiffs. In some cases, Plaintiffs also supplied transactional data, but I found that the Plaintiff-supplied data contained little information that was not found in comparable Defendant-supplied data. I relied on Defendant-supplied data for the quantities, prices, and other terms of individual transactions.

(268) The scope and time-span of data produced varied from Defendant to Defendant. BASF, Bayer, and Dow produced customer-level electronic data from 1992 through 2008. Huntsman produced customer-level data in electronic form from 1996 through 2008 and in hard-copy form for 1993 through 1995. Lyondell initially produced customer-level electronic data for 1995 through 2005 (with significant gaps in 1996 and 1997) and monthly summaries of quantities sold for 1994.<sup>343</sup> Appendix E contains additional detail on the combined Defendant-supplied data.

(269) One data constraint arose in connection with the classification of products. I generally had sufficient information to comprehensively classify TDI and MDI products into the various product categories. In particular, I was able to identify TDI and MDI that fell into the TDI 80/20 and polymeric MDI benchmark product categories for which I constructed benchmark price models. I was also able to identify polyols products that fell into the CFS benchmark product category. The remaining product categories proved to be more challenging. As described in paragraph (81), because of either a lack of available information or their low individual sales, I did not attempt to classify all remaining polyols products.

(270) Accordingly, I decided to estimate the relationship between prices of the three benchmark product categories—TDI 80/20, polymeric MDI, and CFS polyols—and supply and demand variables (see section 6.5) and to employ transaction-specific models to estimate prices for each specific product (see section 6.6).

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<sup>343</sup> On April 14, 2011, one day before this report was submitted, Lyondell provided polyols sales quantity data in hard copy form for 1996 and 1997. I have reviewed and incorporated this information into this revised report as described in Appendix E.

## 6.5. Benchmark product category models

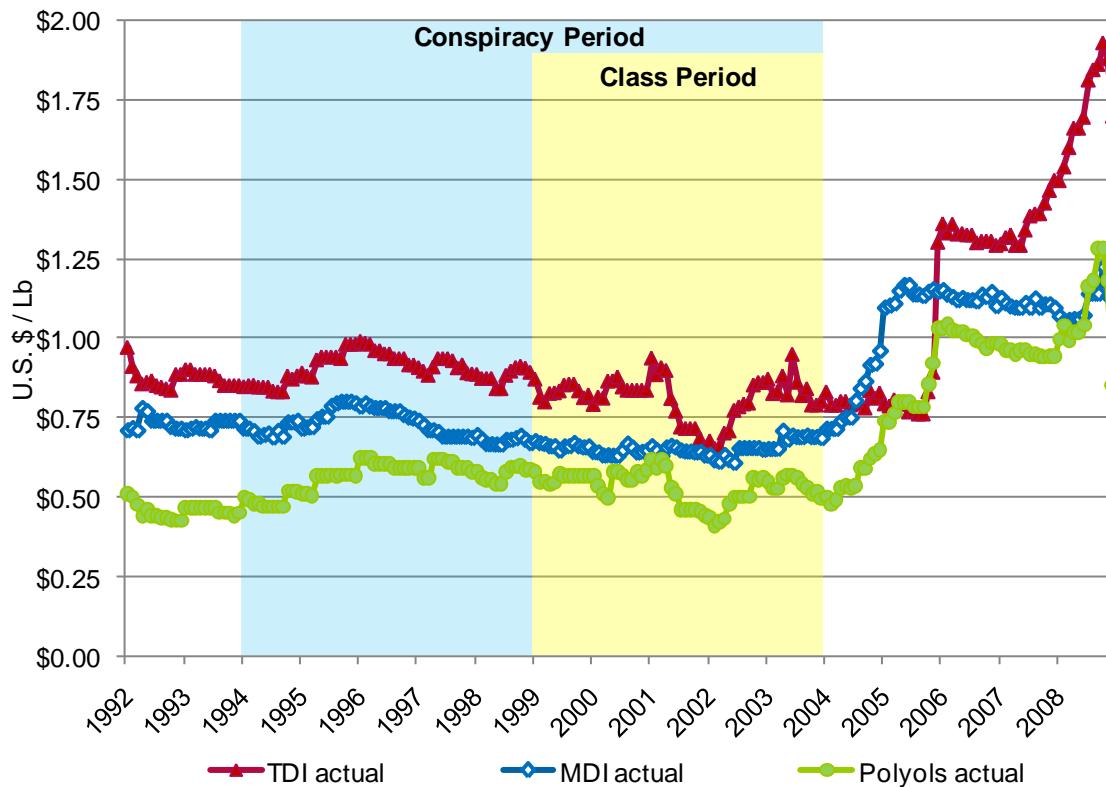
(271) As noted above, I calculated Plaintiffs' overcharges in two steps. First, I constructed econometric models of the prices of the three benchmark product categories: TDI 80/20, polymeric MDI, and CFS polyols. Second, I analyzed the relationship between the prices of the benchmark product categories and the prices paid for all individual products Plaintiffs purchased and I calculated overcharges for every transaction. This section describes my econometric approach to the first step.

(272) For each of the benchmark product categories, I combined the Defendant-supplied data on the transaction prices paid by Plaintiffs and all other non-Defendant purchasers into a price series. Standard adjustments to the data, however, were appropriate.<sup>344</sup> Figure 59 depicts these price series.

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<sup>344</sup> I removed "outlier" transactions whose unit price (per pound) was less than 10¢ or greater than \$10. I also excluded transactions whose reported dollar amount or quantity were either missing or not positive (indicating a return or rebate rather than a purchase) and transactions for which I could not discern the unit of measurement (e.g., pounds versus kilograms), the date of the transaction, or the identity of the purchaser. Collectively, less than 2% of sales to all purchasers (excluding Defendants) were excluded as a result of these criteria.

Figure 59 Benchmark product category prices (TDI 80/20, polymeric MDI, CFS polyols)



Source: Combined transaction database

(273) As a general principle, I used all available preconspiracy and postconspiracy data to estimate the benchmark models. I used standard regression analysis to estimate the relationship between the benchmark product category's prices and the appropriate supply and demand variables. The benchmark period that I used for estimating my regression models was January 1992 through December 1993 and January 2004 through December 2008.

(274) I estimated this econometric relationship for each of the three benchmark product categories. I selected the supply and demand variables for each model by using a combination of economic judgment and well-established econometric criteria. First, relying upon economic theory and my understanding of the polyurethanes industry, I identified a set of key supply and demand variables. These include major raw materials, Hurricanes Katrina and Rita, and

the demand variables. The post-2005 variables were also in the set of key variables for TDI 80/20 and CFS polyols.<sup>345</sup>

- (275) In addition to supply and demand variables, the benchmark product category regressions include lagged prices. This allows for a wide range of pricing dynamics, such as gradual adjustment from one price level to another. The models do not rule out the possibility that adjustments are instantaneous; they simply allow the data to resolve this issue.
- (276) Including lagged prices is common practice in the time series forecasting literature. A leading textbook on forecasting states the following: “A multivariate model (in this case, a regression model) should relate the current value  $y$  [here, price] to its own past and to the past of  $x$  [here, the supply and demand variables]...we never want to eliminate from the outset the possibility that lagged dependent variables play a role.”<sup>346</sup> The textbook explains that “Lagged dependent variables ...can *dramatically* enhance forecasting performance.”<sup>347</sup>
- (277) For the TDI 80/20 and CFS polyols benchmark product category models, I included lagged prices of both TDI 80/20 and CFS polyols. I did this because the strong complementary relationship between TDI 80/20 and CFS polyols suggests that the price adjustment dynamics of TDI 80/20 and CFS polyols might be interrelated.<sup>348</sup>
- (278) In addition to the key supply and demand variables and the lagged prices, other variables could help improve the accuracy of my econometric models. To account for the possibility that additional supply and demand variables could improve the accuracy of my models, I employed a well-known and established criterion, the Akaike information criterion (AIC).<sup>349</sup>

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<sup>345</sup> Because TDI is used in proportion with polyols and because the major polyols suppliers are also major TDI suppliers, it is likely that the 2005 consolidation and capacity reduction by TDI suppliers also affected the pricing of polyols. While there appears to be a less direct relationship between the 2005 structural change in the TDI industry and MDI pricing, I allowed for the structural change to potentially impact MDI pricing in my analysis of MDI prices.

<sup>346</sup> Francis X. Diebold, *Elements of Forecasting*, 4<sup>th</sup> ed. (Mason, OH: South-Western College Publishing, 2007) at 225.

<sup>347</sup> Francis X. Diebold, *Elements of Forecasting*, 4<sup>th</sup> ed. (Mason, OH: South-Western College Publishing, 2007) at 225-26 (emphasis in original).

<sup>348</sup> See *infra* ¶¶ (44)–(45).

<sup>349</sup> AIC provides a balance between the accuracy and the complexity of the model. It is well known that adding too many variables to an econometric model can *reduce* its accuracy in estimating the variable of interest (here, prices) outside of the original data sample; AIC is designed to address this problem. See Hirotugu Akaike, “A New Look at the Statistical Model Identification,” *IEEE Transactions on Automatic Control* 19, no. 6 (1974): 716–23; Rieta Shibata, “Asymptotically Efficient Selection of the Order of the Model for Estimating Parameters of a Linear Process,” *Annals of Statistics*, 8, no. 1 (1980): 147–64.

AIC is commonly used in practice to determine whether additional variables should be included, just as I have done

(279) After estimating the benchmark product category models, I used them to derive the but-for prices that would have prevailed but for the conspiracy for each of the three benchmark product categories. As a way of assessing the performance of my model, and because prices might have remained artificially elevated even after the conspiracy period, I computed but-for prices for the benchmark products through December 2008.

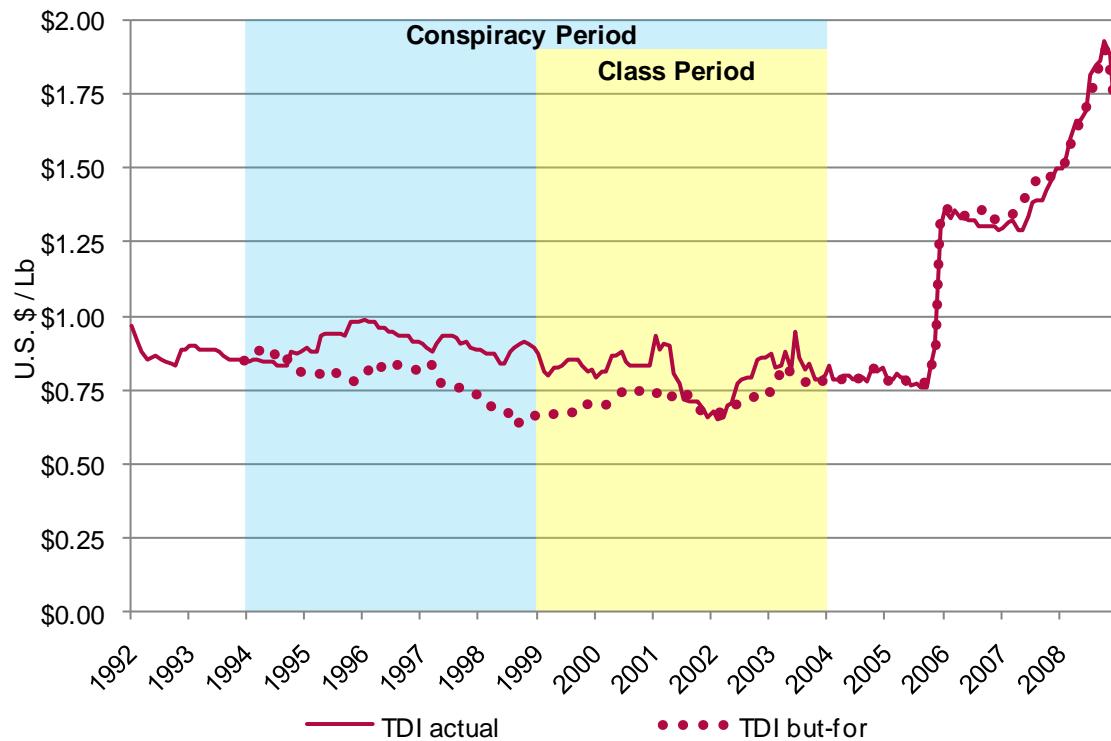
(280) This was done as follows. I started with January 1994 and computed the but-for price by using the December 1993 actual price and actual values of all other supply and demand variables. The price in December 1993 was treated as unaffected by the conspiracy. Starting with February 1994, but-for prices were consecutively computed for each month by using the but-for prices from the previous month and the actual values of the supply and demand variables. I continued in this way month by month, rolling forward but-for price estimates throughout the conspiracy period and beyond. Consequently, the constructed but-for prices directly embodied observed pricing behavior for the benchmark period, while accounting for changes in supply and demand during and following the conspiracy period.

(281) The resulting but-for prices are depicted in Figure 60, Figure 61, and Figure 62.

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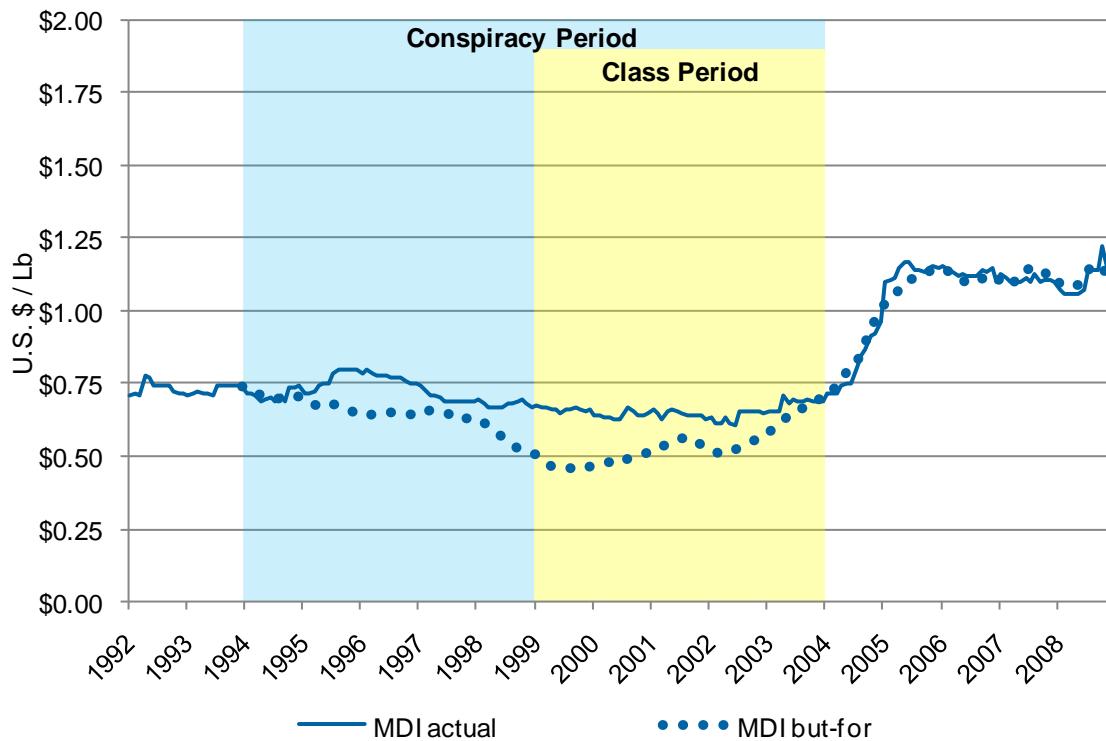
here. See, e.g., Massimiliano Marcellino, James H. Stock, and Mark W. Watson, "A Comparison of Direct and Iterated Multistep AR Methods for Forecasting Macroeconomic Time Series," *Journal of Econometrics* 135, no. 1–2 (2006): 499–526; John Y. Campbell and Robert J. Shiller, "Cointegration and Tests of Present Value Models," *Journal of Political Economy* 95, no. 5 (1987): 1062–88; Panayiotis T. Hecodossiou, "Predicting Shifts in the Mean of a Multivariate Time Series Process: An Application in Predicting Business Failures," *Journal of the American Statistical Association* 88, no. 422 (1993): 441–49.

Figure 60 Actual and but-for prices for TDI 80/20



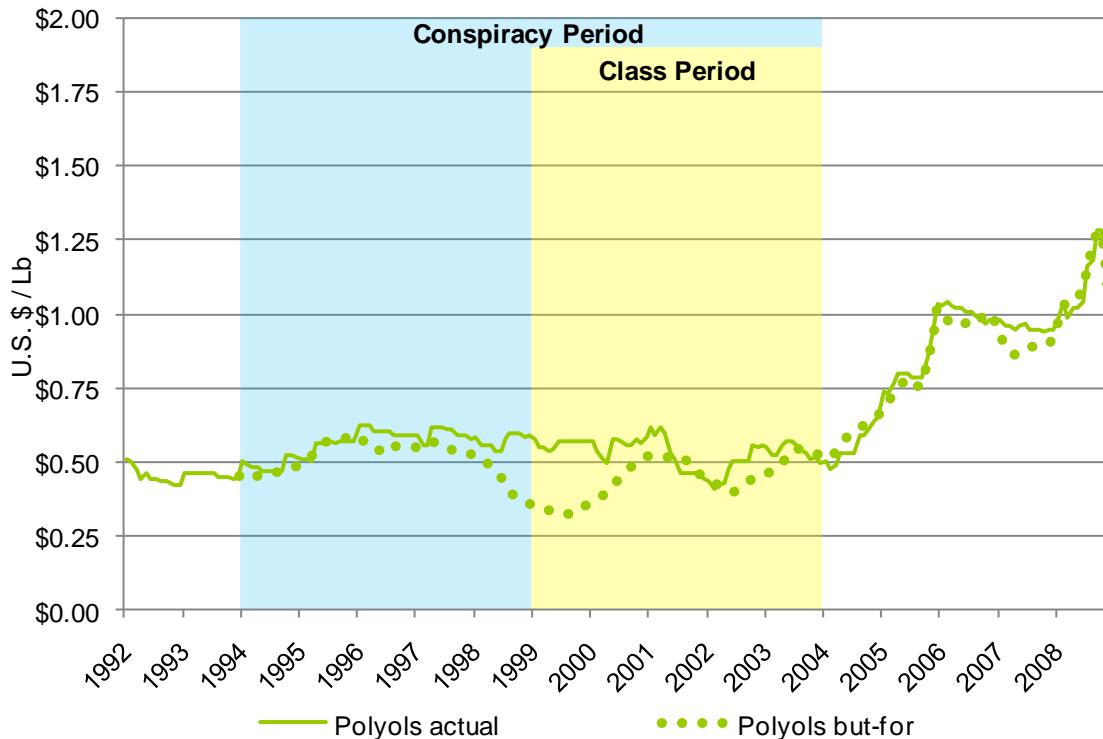
Source: Combined transaction database and Bates White analysis

Figure 61 Actual and but-for prices for polymeric MDI



Source: Combined transaction database and Bates White analysis

Figure 62 Actual and but-for prices for CFS polyols



Source: Combined transaction database and Bates White analysis

(282) I have examined standard diagnostics for evaluating the performance of my regression analysis. In each case, the results indicate that the models perform well. In addition, the estimated but-for price series themselves provide significant evidence that they are accurate and reliable. As depicted above, the but-for price series were continued after the end of the conspiracy period. For all three benchmark product categories, the estimated but-for prices matched up closely with the actual prices following 2003. This indicates that my but-for prices accurately captured the dynamics of the polyurethanes industry in the absence of a conspiracy. This close fit between actual and but-for prices following 2003 indicates that the models properly accounted for changes in supply and demand variables. I noted that my but-for prices in 2004 track actual prices, consistent with my instruction to assume a conspiracy through December 2003. Finally, I noted that all three of my benchmark product category models estimate sizeable overcharges for the period 1994–1998. This is consistent with a conspiracy being in effect during that time, and supports my decision to not include data from 1994–1998 in my benchmark period.

## 6.6. Transaction-level models

(283) The second step of my analysis was to model the prices charged on individual transactions for each product at issue. The approach to calculating overcharges for a specific product depended upon whether the prices of the product exhibited a systematic relationship over time to the prices of a benchmark product.

(284) To determine whether the prices of a particular product exhibited a systematic relationship to the prices of a benchmark product category, I employed a standard regression model of the product prices' on the prices of the benchmark product category.<sup>350</sup> For TDI products, the price of TDI 80/20 was used as a benchmark. Similarly, the price of polymeric MDI was used as a benchmark for MDI products, and the price of CFS polyols was used as a benchmark for polyol products. For TDI/MDI blends, I selected either the TDI 80/20 price or the polymeric MDI price, as appropriate.<sup>351</sup>

(285) I estimated the transaction-level regression over the entire time-span, including both the conspiracy and benchmark periods, because my focus in this step was whether there was a systematic relationship between the transaction prices of a product and the prices of the relevant benchmark product category. Furthermore, because some products were only purchased over a limited period of time, I only included products with at least 20 transactions.<sup>352</sup>

(286) For products for which, based upon the transaction-level model, the benchmark category price accounted for at least 60% of the variation in the product prices, I employed the

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<sup>350</sup> I included an additional variable for polyols that were sold by Lyondell and then by Bayer after its acquisition of Lyondell in 2000. The prices of some of these polyols fell immediately following the acquisition. I allowed the model to account for these changes in prices by including a dummy variable for the change in supplier.

<sup>351</sup> There were only four TDI/MDI blends at issue. For TDI/MDI blends, I used the TDI benchmark price if the blend contained mostly TDI, and the polymeric MDI benchmark price if the product contained mostly MDI. To determine the composition of each blend, I used technical data sheets and other information. As an example, according to a Huntsman internal document, HC001146268, Rubinate 9030 was obtained by mixing together 25 parts of MDI and 75 parts of TDI. As a result, I used TDI 80/20 as the benchmark price for Rubinate 9030.

<sup>352</sup> Prior to estimating these regressions, I first removed certain transactions from the sample set. The removed transactions included "outliers" defined as a transaction whose price does not meet both of the following conditions: (1) the unit price (per pound) must lie between 10¢ and \$10, and (2) the unit price (per pound) must not be more than 25¢ apart from the corresponding product weighted median price. The exclusion of outliers is standard practice. I also excluded transactions whose reported dollar amount or quantity were either missing or not positive (indicating a return or rebate rather than a purchase) and transactions for which I could not discern the unit of measurement (e.g., pounds versus kilograms), the date of the transaction, or the identity of the purchaser. Collectively, approximately 2% of sales to Plaintiffs were excluded as a result of these criteria.

transaction-level model to calculate transaction-level overcharges. This criterion was satisfied by 93% of TDI sales, 86% of MDI sales, and 80% of polyols sales.

(287) For each product that satisfied this criterion, I used the estimated transaction-level model in combination with the but-for prices for the associated benchmark product category to construct the prices that would have prevailed on any individual transaction but for the conspiracy. The but-for price for any given transaction was obtained as the sum of two components. The first component was a fitted price, which was determined by the relationship with the benchmark product category price and the but-for benchmark product category price. The second component was an estimated residual. This was equal to the part of the individual transaction's actual price that the transaction-level model could not account for. This second part accounted for any effects not explicitly accounted for by the model, such as idiosyncratic factors' effect on price.<sup>353</sup> Such factors include (but are not necessarily limited to) the identity of the customer and the nature of the relationship (and contract, if any) between the customer and the vendor.

(288) For products that did not satisfy the criterion, I estimated overcharges for each transaction by identifying comparable transactions and applying their average weighted overcharges.<sup>354</sup> Comparable transactions were identified by matching as many as possible of the following characteristics: product category (e.g., polymeric MDI; HR flexible polyols), product family (i.e., TDI, MDI, or polyols), supplier; customer, year, and month.<sup>355</sup>

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<sup>353</sup> See, e.g., Expert Report of D. Bernheim at 182, submitted on May 24, 2002, in the matter of *In Re Vitamins Antitrust Litigation*.

<sup>354</sup> I also use this approach for products that had fewer than 20 transactions, for transactions whose reported price or quantity were not positive (indicating a return or rebate rather than a purchase), and for transactions with a nonstandard unit of measurement. I did not calculate overcharges on "outlier" purchases (as defined in footnote 352), purchases missing an invoice date, and purchases with a missing purchaser.

<sup>355</sup> A similar approach was used to estimate overcharges for polyol sales by Lyondell in 1994, 1996, and 1997, as described in Appendix E. For these sales, Lyondell only provided data showing the quantities purchased, with no indication of the associated price or dollar amount. Adjustments also were made for certain purchases by Lubrizol of Huntsman's Rubinate 44, to account for a long-term supply contract between Lubrizol and Huntsman that apparently was in effect from January 1996 through December 2001. Because the contractual pricing terms appeared to limit the ability of the product prices to adjust with other prices, overcharges were calculated applying the average overcharge percentage from the first month of the contract, January 1996, to all purchases made from January 1996 through December 2001. This method was not used in January 2002 and after, because starting in January 2002, price adjustments corresponding to movements in other prices appear to have occurred.

## 6.7. Calculation of damages

- (289) By using the but-for transaction prices estimated in the manner described above, I calculated transaction specific overcharges as the difference between the actual and the but-for transaction prices. These overcharges were then applied to the purchases in dollars to arrive at dollar overcharges.
- (290) I computed overcharges for every Plaintiff transaction in the conspiracy period. One issue was whether to include only transactions with positive overcharges, i.e., transactions for which the actual price exceeds the but-for price, or whether to also include transactions with negative overcharges, because the but-for price exceeds the actual price. On balance, to be conservative, I included negative-overcharge transactions.
- (291) Figure 63 and Figure 64 provide a summary of the purchases, overcharge percentages, and overcharges during the conspiracy period. Figure 65 and Figure 66 provide a summary of the purchases, overcharge percentages and overcharges during the Class period.

**Figure 63 Plaintiffs' total purchases, overcharge percentages, and overcharges by Defendant during the conspiracy period (January 1994–December 2003)**

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
British Vita	BASF	\$121,703,936	9.0%	\$10,995,330
	Bayer	\$271,702,496	12.9%	\$35,032,725
	Dow	\$68,354,098	19.2%	\$13,152,644
	Huntsman			
	Lyondell	\$64,959,362	14.5%	\$9,387,585
British Vita Total		<b>\$526,719,892</b>	<b>13.0%</b>	<b>\$68,568,284</b>
Carpenter	BASF	\$257,029,980	12.2%	\$31,257,016
	Bayer	\$225,698,375	12.2%	\$27,631,310
	Dow	\$21,843,473	18.1%	\$3,954,090
	Huntsman	\$9,539,055	11.6%	\$1,108,145
	Lyondell	\$601,776,388	11.1%	\$66,784,067
Carpenter Total		<b>\$1,115,887,271</b>	<b>11.7%</b>	<b>\$130,734,629</b>
Flexible Foam	BASF	\$30,876,537	14.3%	\$4,405,193
	Bayer	\$252,980,397	10.4%	\$26,403,696
	Dow	\$6,286,713	10.4%	\$654,359
	Huntsman	\$173,132,045	11.5%	\$19,893,685
	Lyondell	\$261,255,272	13.3%	\$34,816,522
Flexible Foam Total		<b>\$724,530,964</b>	<b>11.9%</b>	<b>\$86,173,455</b>
Foam Supplies	BASF	\$7,355,355	22.0%	\$1,619,100
	Bayer	\$12,126,799	12.8%	\$1,549,153
	Dow	\$44,606,526	14.3%	\$6,373,750
	Huntsman	\$6,032,563	11.1%	\$671,066
	Lyondell	\$1,441,296	11.8%	\$170,258
Foam Supplies Total		<b>\$71,562,539</b>	<b>14.5%</b>	<b>\$10,383,326</b>
Hickory Springs	BASF	\$399,819,155	11.8%	\$47,263,868
	Bayer	\$202,726,570	8.9%	\$18,131,608
	Dow	\$89,610,306	11.9%	\$10,647,652
	Huntsman	\$7,121,391	13.0%	\$927,236
	Lyondell	\$25,104,155	16.7%	\$4,192,053
Hickory Springs Total		<b>\$724,381,577</b>	<b>11.2%</b>	<b>\$81,162,417</b>
Huber	BASF	\$480,292	18.7%	\$89,781
	Bayer	\$116,145,309	11.5%	\$13,399,525
	Dow			
	Huntsman	\$125,920,787	15.8%	\$19,845,919
	Lyondell			
Huber Total		<b>\$242,546,388</b>	<b>13.7%</b>	<b>\$33,335,225</b>
Leggett & Platt	BASF	\$137,898,512	12.1%	\$16,745,353
	Bayer	\$3,939,736	7.8%	\$308,299
	Dow	\$383,235,735	12.7%	\$48,652,068
	Huntsman	\$44,407,979	15.5%	\$6,869,082
	Lyondell	\$5,301,128	8.6%	\$457,255
Leggett & Platt Total		<b>\$574,783,090</b>	<b>12.7%</b>	<b>\$73,032,057</b>
Lubrizol	BASF	\$182,162	3.0%	\$5,537
	Bayer	\$29,139,200	5.8%	\$1,703,790

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
	Dow			
	Huntsman	\$60,492,149	7.2%	\$4,341,111
	Lyondell			
Lubrizol Total		<b>\$89,813,511</b>	<b>6.7%</b>	<b>\$6,050,438</b>
MarChem	BASF	\$3,548,443	8.4%	\$299,193
	Bayer	\$55,895,091	10.5%	\$5,860,806
	Dow	\$38,714,829	12.2%	\$4,740,732
	Huntsman	\$50,347	9.9%	\$4,998
	Lyondell	\$33,208,927	9.5%	\$3,153,133
MarChem Total		<b>\$131,417,636</b>	<b>10.7%</b>	<b>\$14,058,863</b>
Skypark	BASF	\$46,977	18.3%	\$8,606
	Bayer	\$9,096,939	16.9%	\$1,533,712
	Dow	\$33,700,699	15.7%	\$5,288,104
	Huntsman	\$16,378,808	14.8%	\$2,418,541
	Lyondell	\$11,080,436	14.1%	\$1,567,083
Skypark Total		<b>\$70,303,858</b>	<b>15.4%</b>	<b>\$10,816,046</b>
Woodbridge	BASF	\$208,614,225	12.7%	\$26,511,190
	Bayer	\$488,325,690	5.9%	\$28,992,872
	Dow	\$119,994,885	9.1%	\$10,861,178
	Huntsman	\$17,000,280	10.7%	\$1,816,031
	Lyondell	\$325,400,053	10.5%	\$34,291,339
Woodbridge Total		<b>\$1,159,335,133</b>	<b>8.8%</b>	<b>\$102,472,609</b>
Total	BASF	\$1,167,555,574	11.9%	\$139,200,167
	Bayer	\$1,667,776,602	9.6%	\$160,547,497
	Dow	\$806,347,263	12.9%	\$104,324,578
	Huntsman	\$460,075,404	12.6%	\$57,895,813
	Lyondell	\$1,329,527,018	11.6%	\$154,819,294
Grand Total		<b>\$5,431,281,860</b>	<b>11.4%</b>	<b>\$616,787,349</b>

**Figure 64 Plaintiffs' total purchases, overcharge percentages, and overcharges by product family during the conspiracy period (January 1994–December 2003)**

Plaintiff	Product family	Purchases	Overcharge percentage	Overcharges
British Vita	TDI	\$230,989,008	12.4%	\$28,587,162
	MDI	\$3,962,905	16.2%	\$641,462
	Polyols	\$291,767,979	13.5%	\$39,339,660
British Vita Total		<b>\$526,719,892</b>	<b>13.0%</b>	<b>\$68,568,284</b>
Carpenter	TDI	\$746,743,044	13.8%	\$102,909,975
	MDI	\$102,527,178	15.5%	\$15,883,695
	Polyols	\$266,617,050	4.5%	\$11,940,958
Carpenter Total		<b>\$1,115,887,271</b>	<b>11.7%</b>	<b>\$130,734,629</b>
Flexible Foam	TDI	\$309,772,877	12.2%	\$37,839,899
	MDI	\$21,952,452	9.5%	\$2,081,972
	Polyols	\$392,805,635	11.8%	\$46,251,584
Flexible Foam Total		<b>\$724,530,964</b>	<b>11.9%</b>	<b>\$86,173,455</b>
Foam Supplies	TDI			
	MDI	\$62,077,374	14.8%	\$9,182,294
	Polyols	\$9,485,166	12.7%	\$1,201,031
Foam Supplies Total		<b>\$71,562,539</b>	<b>14.5%</b>	<b>\$10,383,326</b>
Hickory Springs	TDI	\$326,121,734	9.7%	\$31,779,886
	MDI	\$7,882,307	16.5%	\$1,301,922
	Polyols	\$390,377,537	12.3%	\$48,080,609
Hickory Springs Total		<b>\$724,381,577</b>	<b>11.2%</b>	<b>\$81,162,417</b>
Huber	TDI			
	MDI	\$241,416,373	13.8%	\$33,269,403
	Polyols	\$1,130,015	5.8%	\$65,822
Huber Total		<b>\$242,546,388</b>	<b>13.7%</b>	<b>\$33,335,225</b>
Leggett & Platt	TDI	\$218,338,680	12.4%	\$27,142,205
	MDI	\$55,252,985	11.1%	\$6,135,835
	Polyols	\$301,191,425	13.2%	\$39,754,016
Leggett & Platt Total		<b>\$574,783,090</b>	<b>12.7%</b>	<b>\$73,032,057</b>
Lubrizol	TDI			
	MDI	\$89,813,511	6.7%	\$6,050,438
	Polyols			
Lubrizol Total		<b>\$89,813,511</b>	<b>6.7%</b>	<b>\$6,050,438</b>
MarChem	TDI	\$802,995	7.3%	\$58,657
	MDI	\$75,804,618	12.5%	\$9,459,815
	Polyols	\$54,810,023	8.3%	\$4,540,390
MarChem Total		<b>\$131,417,636</b>	<b>10.7%</b>	<b>\$14,058,863</b>
Skypark	TDI	\$3,630	-0.5%	-\$17
	MDI	\$39,754,338	16.9%	\$6,721,285
	Polyols	\$30,545,890	13.4%	\$4,094,779
Skypark Total		<b>\$70,303,858</b>	<b>15.4%</b>	<b>\$10,816,046</b>
Woodbridge	TDI	\$383,735,332	11.5%	\$44,251,218
	MDI	\$20,664,270	14.4%	\$2,976,771
	Polyols	\$754,935,531	7.3%	\$55,244,619
Woodbridge Total		<b>\$1,159,335,133</b>	<b>8.8%</b>	<b>\$102,472,609</b>
Total	TDI	\$2,216,507,298	12.3%	\$272,568,986
	MDI	\$721,108,311	13.0%	\$93,704,894
	Polyols	\$2,493,666,252	10.0%	\$250,513,469
Grand Total		<b>\$5,431,281,860</b>	<b>11.4%</b>	<b>\$616,787,349</b>

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**Figure 65 Plaintiffs' total purchases, overcharge percentages, and overcharges by Defendant during the class period (January 1999–December 2003)**

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
British Vita	BASF	\$80,878,036	9.8%	\$7,933,689
	Bayer	\$161,834,543	13.1%	\$21,146,111
	Dow	\$42,260,872	20.8%	\$8,801,071
	Huntsman			
	Lyondell	\$21,458,650	25.8%	\$5,532,523
British Vita Total		<b>\$306,432,100</b>	<b>14.2%</b>	<b>\$43,413,394</b>
Carpenter	BASF	\$88,480,783	11.6%	\$10,221,513
	Bayer	\$178,245,201	10.9%	\$19,384,923
	Dow	\$16,305,518	19.9%	\$3,247,610
	Huntsman	\$4,599,280	14.9%	\$684,365
	Lyondell	\$252,304,732	13.5%	\$33,979,239
Carpenter Total		<b>\$539,935,514</b>	<b>12.5%</b>	<b>\$67,517,650</b>
Flexible Foam	BASF	\$21,351,503	13.5%	\$2,880,466
	Bayer	\$180,567,286	9.1%	\$16,500,828
	Dow	\$6,254,975	10.4%	\$651,652
	Huntsman	\$96,306,226	10.2%	\$9,843,620
	Lyondell	\$52,434,899	36.2%	\$18,972,999
Flexible Foam Total		<b>\$356,914,888</b>	<b>13.7%</b>	<b>\$48,849,564</b>
Foam Supplies	BASF	\$6,367,391	22.0%	\$1,400,252
	Bayer	\$1,430,097	27.9%	\$398,426
	Dow	\$24,796,758	16.9%	\$4,178,816
	Huntsman	\$5,363,424	10.4%	\$555,498
	Lyondell	\$367,461	29.0%	\$106,632
Foam Supplies Total		<b>\$38,325,131</b>	<b>17.3%</b>	<b>\$6,639,624</b>
Hickory Springs	BASF	\$228,310,860	12.7%	\$29,013,492
	Bayer	\$129,600,267	8.3%	\$10,772,573
	Dow	\$20,791,398	22.6%	\$4,701,827
	Huntsman	\$3,658,852	18.4%	\$674,959
	Lyondell	\$9,572,902	33.3%	\$3,184,196
Hickory Springs Total		<b>\$391,934,279</b>	<b>12.3%</b>	<b>\$48,347,046</b>
Huber	BASF	\$480,292	18.7%	\$89,781
	Bayer	\$116,128,488	11.5%	\$13,398,094
	Dow			
	Huntsman	\$93,124,082	17.3%	\$16,077,860
	Lyondell			
Huber Total		<b>\$209,732,862</b>	<b>14.1%</b>	<b>\$29,565,735</b>
Leggett & Platt	BASF	\$74,882,011	13.2%	\$9,909,155
	Bayer	\$1,181,072	7.0%	\$83,018
	Dow	\$222,814,186	14.0%	\$31,284,589
	Huntsman	\$22,998,678	15.7%	\$3,614,559
	Lyondell	\$674,137	24.9%	\$168,184
Leggett & Platt Total		<b>\$322,550,085</b>	<b>14.0%</b>	<b>\$45,059,506</b>

Plaintiff	Defendant	Purchases	Overcharge percentage	Overcharges
Lubrizol	BASF	\$71,125	7.9%	\$5,620
	Bayer	\$16,187,627	6.6%	\$1,065,425
	Dow			
	Huntsman	\$29,625,595	7.9%	\$2,326,635
	Lyondell			
Lubrizol Total		\$45,884,348	7.4%	\$3,397,680
MarChem	BASF	\$3,430,746	8.6%	\$294,789
	Bayer	\$44,512,875	10.4%	\$4,610,392
	Dow	\$17,262,464	15.6%	\$2,698,395
	Huntsman			
	Lyondell	\$5,163,583	28.1%	\$1,450,549
MarChem Total		\$70,369,668	12.9%	\$9,054,125
Skypark	BASF	\$46,977	18.3%	\$8,606
	Bayer	\$8,158,695	18.4%	\$1,503,954
	Dow	\$12,489,452	26.0%	\$3,249,496
	Huntsman	\$7,790,800	20.1%	\$1,569,694
	Lyondell	\$3,670,164	27.5%	\$1,008,318
Skypark Total		\$32,156,087	22.8%	\$7,340,069
Woodbridge	BASF	\$104,451,069	11.1%	\$11,562,339
	Bayer	\$437,646,291	5.2%	\$22,738,930
	Dow	\$68,395,534	12.0%	\$8,205,631
	Huntsman	\$9,136,742	9.0%	\$821,708
	Lyondell	\$99,464,030	18.7%	\$18,635,846
Woodbridge Total		\$719,093,665	8.6%	\$61,964,455
Total	BASF	\$608,750,793	12.0%	\$73,319,701
	Bayer	\$1,275,492,442	8.7%	\$111,602,675
	Dow	\$431,371,156	15.5%	\$67,019,087
	Huntsman	\$272,603,681	13.3%	\$36,168,899
	Lyondell	\$445,110,556	18.7%	\$83,038,487
Grand Total		\$3,033,328,627	12.2%	\$371,148,848

**Figure 66 Plaintiffs' total purchases, overcharge percentages, and overcharges by product family during the class period (January 1999–December 2003)**

Plaintiff	Product family	Purchases	Overcharge percentage	Overcharges
British Vita	TDI	\$131,539,976	10.9%	\$14,326,276
	MDI	\$2,383,646	19.1%	\$455,053
	Polyols	\$172,508,478	16.6%	\$28,632,065
British Vita Total		<b>\$306,432,100</b>	<b>14.2%</b>	<b>\$43,413,394</b>
Carpenter	TDI	\$469,763,860	11.6%	\$54,579,719
	MDI	\$59,428,028	18.6%	\$11,042,254
	Polyols	\$10,743,626	17.6%	\$1,895,677
Carpenter Total		<b>\$539,935,514</b>	<b>12.5%</b>	<b>\$67,517,650</b>
Flexible Foam	TDI	\$153,234,135	10.8%	\$16,565,168
	MDI	\$21,432,397	9.5%	\$2,031,881
	Polyols	\$182,248,356	16.6%	\$30,252,515
Flexible Foam Total		<b>\$356,914,888</b>	<b>13.7%</b>	<b>\$48,849,564</b>
Foam Supplies	TDI			
	MDI	\$33,578,387	17.5%	\$5,862,546
	Polyols	\$4,746,744	16.4%	\$777,078
Foam Supplies Total		<b>\$38,325,131</b>	<b>17.3%</b>	<b>\$6,639,624</b>
Hickory Springs	TDI	\$173,868,980	8.6%	\$14,907,476
	MDI	\$6,807,874	17.0%	\$1,159,419
	Polyols	\$211,257,425	15.3%	\$32,280,152
Hickory Springs Total		<b>\$391,934,279</b>	<b>12.3%</b>	<b>\$48,347,046</b>
Huber	TDI			
	MDI	\$208,604,783	14.1%	\$29,499,913
	Polyols	\$1,128,079	5.8%	\$65,823
Huber Total		<b>\$209,732,862</b>	<b>14.1%</b>	<b>\$29,565,735</b>
Leggett & Platt	TDI	\$122,527,363	10.9%	\$13,308,025
	MDI	\$30,938,146	13.7%	\$4,238,517
	Polyols	\$169,084,575	16.3%	\$27,512,963
Leggett & Platt Total		<b>\$322,550,085</b>	<b>14.0%</b>	<b>\$45,059,506</b>
Lubrizol	TDI			
	MDI	\$45,884,348	7.4%	\$3,397,680
	Polyols			
Lubrizol Total		<b>\$45,884,348</b>	<b>7.4%</b>	<b>\$3,397,680</b>
MarChem	TDI	\$309,344	8.9%	\$27,480
	MDI	\$45,167,697	14.0%	\$6,308,889
	Polyols	\$24,892,627	10.9%	\$2,717,755
MarChem Total		<b>\$70,369,668</b>	<b>12.9%</b>	<b>\$9,054,125</b>
Skypark	TDI	\$0		\$0
	MDI	\$19,593,675	23.4%	\$4,588,320
	Polyols	\$12,562,412	21.9%	\$2,751,749
Skypark Total		<b>\$32,156,087</b>	<b>22.8%</b>	<b>\$7,340,069</b>
Woodbridge	TDI	\$226,580,957	9.8%	\$22,129,389
	MDI	\$18,463,183	14.6%	\$2,702,727
	Polyols	\$474,049,525	7.8%	\$37,132,339
Woodbridge Total		<b>\$719,093,665</b>	<b>8.6%</b>	<b>\$61,964,455</b>
Total	TDI	\$1,277,824,614	10.6%	\$135,843,533
	MDI	\$492,282,165	14.5%	\$71,287,199
	Polyols	\$1,263,221,849	13.0%	\$164,018,116
Grand Total		<b>\$3,033,328,627</b>	<b>12.2%</b>	<b>\$371,148,848</b>



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May 13, 2011

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Date

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## **Appendix A. Curriculum vitae**

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## Matthew E. Raiff, PhD Partner

### Summary of experience

Dr. Matthew E. Raiff is a founding member of Bates White. He has significant experience in the application of economic and statistical analysis to antitrust and other economic and financial issues. Dr. Raiff serves as an expert economic consultant on matters primarily involving alleged anticompetitive conduct. With significant experience both in defense and plaintiff matters, he specializes in working on direct and indirect cartel litigation.

### Areas of expertise

- Antitrust analysis
- Econometric and statistical analysis
- Cartels
- Cost-benefit analysis

### Selected experience

- Serving as a testifying expert in *In re Urethanes Antitrust Litigation*. Performing economic analyses to assess damages in connection with antitrust claims.
- Served as one of the lead consulting experts for a large opt-out plaintiff group in *In re Vitamins Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as the lead consulting expert for defendants in *In re Polyester Staple Fiber (PSF) Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as lead consulting expert for defendants in *In re Ethylene Propylene Diene Monomer (EPDM) Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as lead consulting expert for defendants in *In re Polychloroprene (PCP) Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.

- Served as the lead consulting expert to a large coalition of direct action plaintiffs in *In re Linerboard Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as the lead consulting expert to a large coalition of direct action plaintiffs in *In re Rubber Chemicals Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as the lead consulting expert on behalf of direct and indirect plaintiffs in *In re Parcel Tanker Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as one of lead consulting experts on behalf of direct and indirect plaintiffs in *In re Carbon Brushes Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as the lead consulting expert on behalf of direct and indirect plaintiffs in *In re Dynamic Random Access Memory (DRAM) Antitrust Litigation*. Advised on overall case strategy and performed economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Served as lead consulting expert and submitted an expert declaration to support a large international plaintiff group in *In re Graphite Electrode Antitrust Litigation*. Developed economic and statistical analysis to demonstrate the scope of the product and geographic market based on the Supreme Court's opinion in *F. Hoffmann-La Roche, Ltd. v. Empagran S.A.*
- Supported the testifying expert on behalf of a defendant in a price-fixing matter in the construction materials industry regarding issues related to class certification.
- Supported the testifying expert on behalf of a large coalition of direct action plaintiffs in *In re Methionine Antitrust Litigation*. Analyzed industry structure and directed the economic analysis of liability and damage estimation.
- Serving as the lead consulting expert to a defendant in the chemical industry. Advising on overall case strategy.

- Serving as the lead consulting expert to a large coalition of direct action plaintiffs in the transportation industry. Advising on overall case strategy and performing economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Serving as the lead consulting expert to direct action plaintiffs in the electronic industry. Advising on overall case strategy and performing economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Serving as the lead consulting expert to direct action plaintiffs in a manufacturing industry. Advising on overall case strategy and performing economic analyses to assess liability and damages resulting from the illegal conduct in the United States.
- Developed a proprietary cost-benefit model to support the sales of a new technology being brought to market by General Electric Medical Systems. Trained corporate sales force on how to use the cost-benefit model and developed data collection processes to benchmark key assumptions. Received patent for the model.
- Developed microsimulation cost-benefit model to analyze financial outcomes under different contractual arrangements between the U.S. government and U.S. carriers in the oceanic shipping industry. Prepared the presentation to the military as part of the U.S. carriers' contract negotiations with the military.
- Developed models for analyzing the relationship between advertising spending and sales for the retail and pharmaceutical industries. Developed project management work plans for delivering state-of-the-art models to marketing departments.
- Conducted arms-length transfer pricing studies for the automotive industry. Responsibilities included financial and econometric analysis, interviewing clients, and preparing documentation.
- Directed expert analysis on behalf of retailers in the jewelry industry in an indirect class settlement. Assessing degree of pass-through throughout the supply chain to allocate settlement among plaintiff subclasses.
- Analyzed the potential effects of a proposed merger of large retail chains. Analysis used a large panel data set to ascertain the price impact of entry and exit of competitor stores within a given radius. Utilized innovative statistical techniques to rigorously identify the geographic bands at which competitive effects are evident.

## Professional experience

Dr. Raiff is one of the founding partners at Bates White. Previously, he was an Associate with A.T. Kearney, a postdoctoral Economist with The Pennsylvania State University, and an Instructor with the Department of Economics at Duke University.

## Education

- PhD, Economics, Duke University
- MA, Economics, Duke University
- BA, Economics, All-College Honors Program, Canisius College

## Publications

- Matthew E. Raiff, Robert C. Marshall, and Leslie M. Marx. "Cartel Price Announcements: The Vitamins Industry." *International Journal of Industrial Organization*. 26 (2008): 762-802. Awarded the 2009 Paul Geroski Best Article Prize for one of the best two articles published in the *International Journal of Industrial Organization* in 2008.
- Matthew E. Raiff, William Kovacic, Robert C. Marshall, and Leslie M. Marx. "Lessons for Competition Policy from the Vitamins Cartel." In *The Political Economy of Antitrust*, edited by Vivek Ghosal and Johan Stenrek (Amsterdam: Elsevier, 2007).
- ———. "Bidding Rings and the Design of Anti-Collusion Measures for Auctions and Procurements." In *Handbook of Procurement*, edited by N. Dimitri, G. Piga, and G. Spagnolo, 381–411. Cambridge University Press, 2006.
- Matthew E. Raiff, Robert C. Marshall, Jean-Francois Richard, and Steven P. Schulenberg. "The Impact of Delivery Synergies on Bidding in the Georgia School Milk Market." *Topics in Economic Analysis & Policy* 6, no. 1 (2006): article 5.
- Matthew E. Raiff, N.B. DeMarchi, and Hans J. Van Miegroet. "Dealer-Dealer Pricing in the 17th Century Antwerp-Paris Art Trade." In *Art Markets in Early Modern Europe*, edited by Michael North and David Ormrod. Aldershot and Brookfield VT: Ashgate, 1998.

## Professional associations

- American Economic Association
- American Bar Association, Associate Member

Expert Report of Matthew E. Raiff, Ph.D.

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## **Appendix B. Instructions from counsel**

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Plaintiffs' counsel provided me the following assumptions and instructions.

## Assumptions

1. Assume that a conspiracy was in effect with regard to TDI, MDI, and polyether polyols (“polyether polyol products”) from January 1994 through December 2003 (the “conspiracy period”).
2. Assume the corporate participants in the conspiracy include:
  - Defendants BASF SE (f/k/a BASF AG), BASF Corporation, and BASF Coordination Center Comm. V.;
  - Defendant The Dow Chemical Company (Dow) and its predecessor-in-interest EniChem (whose polyurethanes business was acquired by Dow in 2001);
  - Defendant Huntsman International LLC (f/k/a Huntsman ICI Chemicals LLC) (Huntsman) and its predecessor-in-interest Imperial Chemicals Industries Ltd. (ICI);
  - Defendant Lyondell Chemical Company (f/k/a Lyondell Petrochemical Company) and its predecessors-in-interest ARCO Chemical Company and Rhone-Poulenc;
  - Bayer AG, Bayer Corporation, Bayer MaterialScience AG, and Bayer MaterialScience LLC.
3. Assume that the products at issue are
  - TDI products, including various forms of toluene di-isocyanate;
  - MDI products, including various forms of diphenylmethane di-isocyanate, including both monomeric (“pure”) and polymeric forms;
  - blends of MDI and TDI;
  - polyether polyol products, which include various propylene-oxide based polyether polyols.

## Instructions

1. Instructions on specific purchasers and their claims are in the attached document “Plaintiff summaries.” The plaintiff summaries identify purchases of polyether polyol products made by plaintiffs and/or their predecessors-in-interest for which plaintiffs are asserting claims for damages in this litigation.
2. The overcharge on any particular transaction should be calculated as the amount purchased times the difference between the price actually paid and the estimated price that would have been paid but for the conspiracy.
3. Calculate overcharges for the conspiracy period.
4. Calculate overcharges for the period January 1999 through December 2003 (“the class period”).

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## **Appendix C. Plaintiff summaries**

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## **BRITISH VITA UNLIMITED, PATHWAY POLYMERS INC., VITAFOAM INCORPORATED, and VITAFOAM PRODUCTS CANADA LIMITED**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Company Background**

Plaintiff British Vita Unlimited (“British Vita”) is an entity incorporated under the laws of England with its principal place of business in London, United Kingdom. British Vita is a holding company for a group of companies that are engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the bedding, automotive, furniture, military, and plastics industries. British Vita’s predecessor-in-interest Crest Foam Industries Incorporated (“Crest Foam Industries”) is a Delaware corporation with its principal place of business in Moonachie, New Jersey. Crest Foam Industries also has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the automotive, furniture, military, and filtration industries. Crest Foam Industries purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it manufactured, marketed and sold.

Plaintiff Pathway Polymers Inc. (f/k/a Vita Industrial Inc. d/b/a Hyperlast NA and Hyperlast North America) (“Pathway Polymers ”) is a Delaware corporation with its principal place of business in Chattanooga, Tennessee. Pathway Polymers has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the construction, flexible moulding, and tire industries. Pathway Polymers’ predecessors-in-interest Synair Corporation (“Synair”) and Hyperlast North America (“Hyperlast”) also have been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the tire, construction and flexible moulding industries. Pathway Polymers, Synair, and Hyperlast purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that they manufactured, marketed and sold.

Plaintiff Vitafoam Incorporated (“Vitafoam ”) is a North Carolina corporation with its principal place of business in High Point, North Carolina. Vitafoam has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the automotive, resins, wovens, and plastics industries. Vitafoam purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it manufactured, marketed, and sold.

Plaintiff Vitafoam Products Canada Limited (“Vitafoam Canada”) is an entity organized under the laws of Canada with its principal place of business in Downsview, Ontario, Canada. Vitafoam Canada has been engaged in the manufacture, marketing, and sales of products involving a variety of industries and applications, including the furniture, bedding, automotive, packaging, industrial, and medical industries. Vitafoam Canada purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed, and sold.

### **Scope of Claim**

#### **British Vita Unlimited**

British Vita is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest Crest Foam Industries from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name CREST FOAM INDUSTRIES INC.

British Vita is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest Crest Foam Industries from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name CREST FOAM INDUSTRIES INC and the customer name CREST-FOAM CORP. with the customer location MOONACHIE.

British Vita is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest Crest Foam Industries from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name CREST FOAM INDUSTRIES INC and the customer name THE DOW CHEMICAL COMPANY with the ship-to name CREST FOAM INDUSTRIES INC.

British Vita is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest Crest Foam Industries from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name CREST FOAMS.

#### **Pathway Polymers Inc.**

Pathway Polymers is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and its predecessors-in-interest Synair and Hyperlast from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names

HYPERLAST NORTH AMERICA, SYNAIR CORPORATION, PATHWAY POLYMERS, and DOW CHEMICAL CO with the ship-to name HYPERLAST NORTH AMERICA.

Pathway Polymers is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and its predecessors-in-interest Synair and Hyperlast from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer names HYPERLAST NORTH AMERICA, PATHWAY POLYMERS and SYNAIR CORP.

Pathway Polymers is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessors-in-interest Synair and Hyperlast from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names HYPERLAST NORTH AMERICA, SYNAIR CORP, SYNAIR CORPORATION, VITA INDUSTRIAL INC, and THE DOW CHEMICAL COMPANY with the ship-to name SYNAIR CORPORATION.

Pathway Polymers is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names HYPERLAST LTD and PATHWAY POLYMERS.

Pathway Polymers is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest Synair from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name SYNAIR CORPORATION.

### **Vitafoam Incorporated**

Vitafoam is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names VITAFoAM, INC., VITAFoAM INCORPORATED, DO NOT USE VITAFoAM INCORPORATED, and FLEXIBLE FOAM CO with the ship-to name VITAFoAM INCORPORATED.

Vitafoam is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name VITAFoAM INC.

Vitafoam is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the

customer names VITAFOAM INC, VITAFOAM INCORPORATED, THE DOW CHEMICAL COMPANY with the ship-to name VITAFOAM INCORPORATED, and FLEXIBLE FOAM PRODUCTS INC with the ship-to name VITAFOAM INCORPORATED.

Vitafoam is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name VITAFOAM.

### **Vitafoam Products Canada Limited**

Vitafoam Canada is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name BASF CANADA INC. with the ship-to name VITAFOAM PRODUCTS CANADA LTD and the customer name BASF CANADA INC with the ship-to name VITAFOAM PRODUCTS CANADA LTD.

Vitafoam Canada is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name VITAFOAM PRODUCTS CANADA LTD., and the customer name BAYER INC with the ship-to name VITAFOAM PRODUCTS CANADA LTD.

Vitafoam Canada is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name THE DOW CHEMICAL COMPANY with the ship-to name VITAFOAM PRODUCTS CANADA LTD..

Vitafoam Canada is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer names VITAFOAM PRODUCTS CANADA LTD and ARCO CHEMICAL CANADA INC with the ship-to name VITAFOAM PRODUCTS CANADA LTD..

### **CARPENTER CO.**

*Carpenter Co., et al. v. BASF SE, et al.*

## Company Background

Plaintiff Carpenter Co. (f/k/a E. R. Carpenter Company, Incorporated) (“Carpenter”) is a Virginia corporation with its principal place of business in Richmond, Virginia. Carpenter has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the furniture, bedding, carpet cushion, molded foam, packaging, fiber applications, filtration, polyester fiber staple, and expanded polystyrene industries. Carpenter purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed and sold.

Carpenter also has been engaged in the purchase of TDI, MDI, and polyols (“Polyether Polyol Products”) for other Carpenter companies located in the United States and Canada, including, but not limited to, E. R. Carpenter, L.P. (f/k/a Carpenter Chemical, L.P.) and Carpenter Canada Co. (f/k/a Carpenter Canada Ltd. and E. R. Carpenter Company of Canada Limited). Such companies also have been engaged in the marketing, manufacture and sale of products for a variety of industries. Carpenter purchased Polyether Polyol Products for use in the products that Carpenter, E. R. Carpenter, L.P., and Carpenter Canada Co. have manufactured, marketed, and sold.

## Scope of Claim

Carpenter is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name BASF CANADA INC with the ship-to names CARPENTER CO and CARPENTER CO. and the customer names CARPENTER CO and LYONDELL CHEMICAL COMPANY with the ship-to names CARPENTER CO and CARPENTER COMPANY.

Carpenter is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer names CARPENTER CANADA, CARPENTER CANADA LTD, 0923 CARPENTER CO, E.R.CARPENTER, L.P., and CARPENTER COMPANY. Carpenter is not asserting claims for damages based on purchases from Bayer which are identified in the Bayer database under the product names ARCOL POLYOL E-648, ARCOL POLYOL E-900, ARCOL POLYOL E-919, ARCOL POLYOL F-3020, ARCOL POLYOL F-3022, ARCOL POLYOL GP3008, ARCOL POLYOL GP3510, ARCOL POLYOL GP3615, ARCOL POLYOL HS-100, ARCOL, and POLYOL HS-100 SP.

Carpenter is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names BASF CORPORATION with the ship-to name CARPENTER COMPANY,  
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CARPENTER CHEMICAL CO, CARPENTER CO, CARPENTER COMPANY, E R CARPENTER CO, E R CARPENTER EXPORT CO INC, LYONDELL CHEMICAL COMPANY INC with the ship to name CARPENTER COMPANY, and THE DOW CHEMICAL COMPANY with the ship-to names CARPENTER COMPANY and E R CARPENTER EXPORT CO INC.

Carpenter is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names CARPENTER CO and CARPENTER COMPANY.

Carpenter is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer names ARCO CHEMICAL CANADA INC with the ship-to name CARPENTER CANADA LTD., CARPENTER COMPANY, LYONDELL CHEMICAL CANADA INC with the ship-to name CARPENTER CANADA LTD., E R CARPENTER CO IN, E R CARPENTER CO INC, and E R CARPENTER CO. Carpenter is not asserting claims for damages based on purchases from Lyondell which are identified in the Lyondell database under the product names ARCOL POLYOL E-648, ARCOL POLYOL E-900, ARCOL POLYOL E-919, ARCOL POLYOL F-3020, ARCOL POLYOL F-3022, ARCOL POLYOL GP3008, ARCOL POLYOL GP3510, ARCOL POLYOL GP3615, ARCOL POLYOL HS-100, ARCOL, and POLYOL HS-100 SP.

## **FLEXIBLE FOAM PRODUCTS, INC., HIGH STANDARD PAD, INC., NU-FOAM PRODUCTS, INC., OHIO DECORATIVE PRODUCTS, INC., and UNIVERSAL URETHANES, INC.**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Company Background**

Plaintiff Flexible Foam Products, Inc. (“Flexible Foam Products”) is an Ohio corporation with its principal place of business in Spencerville, Ohio.

Plaintiff High Standard Pad, Inc. (“High Standard Pad”) is an Alabama corporation with its principal place of business in Spencerville, Ohio.

Plaintiff Nu-Foam Products, Inc. (“Nu-Foam Products”) is a Tennessee corporation with its principal place of business in Chattanooga, Tennessee.

Plaintiff Ohio Decorative Products, Inc., assignee of claims formerly held by Burkart Foam, Inc. (f/k/a Grand Sheet Metal Products, Inc. and Vidrio Products Company) (“Ohio Decorative Products”) is an Ohio corporation with its principal place of in Spencerville, Ohio.

Plaintiff Universal Urethanes, Inc. (“Universal Urethanes”) is a Texas corporation with its principal place in Spencerville, Ohio.

Flexible Foam Products, High Standard Pad, Nu-Foam Products, Burkart Foam, Inc. and Universal Urethanes have been engaged or were engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the bedding, flooring, furniture, packaging, and automotive industries. Flexible Foam Products, High Standard Pad, Nu-Foam Products, Burkart Foam, Inc. and Universal Urethanes purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that they have manufactured, marketed and sold.

## **Scope of Claims**

### **A. Flexible Foam Products**

Flexible Foam Products is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names: FLEXIBLE FOAM CO., FLEXIBLE FOAM INC, FLEXIBLE FOAM PRODUCTS, FLEXIBLE FOAM CO except for ship-to name VITAFOAM INCORPORATED, and the customer name FLEXIBLE FOAM PRODUCTS INC except for ship-to name NU-FOAM PRODUCTS INC. Flexible Foam Products also is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF, which are identified in the BASF database by the customer name OHIO DECORATIVE PRODUCTS INC with a customer location SPENCERVILLE, OH, US.

Flexible Foam Products is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name CHEM FLUID SOLUTIONS with a ship-to name FLEXIBLE FOAM PRODUCTS, and the customer name FLEXIBLE FOAM PRODUCTS except for customer location CHATTANOOGA and except for ship-to names: BURKART FOAM INC, FLORIFOAM, HIGH STANDARD PAD INC, and NU-FOAM PRODUCTS INC.

Flexible Foam Products is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow

database by the customer name FLEXIBLE FOAM PRODUCTS INC except for ship-to names: VITAFoam INCORPORATED, NU-FOAM PRODUCTS INC, TRANSMONTAIGNE TERMINALING and VOPAK TERMINALS NORTH AMERICA and except for ship-to location BOYCE, TN, US. Flexible Foam Products also is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name THE DOW CHEMICAL COMPANY with the ship to name FLEXIBLE FOAM PRODUCTS INC.

Flexible Foam Products is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUCTS INC except for ship-to names BURKHART FOAM DIV FFP, HIGH STANDARD PAD, NU-FOAM and UNIVERSAL URETHANES. Flexible Foam Products is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell, which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUC except for ship-to locations CAIRO, IL, US, CHATTANOOGA, TN, US, HOUSTON, TX, US and STEVENSON, AL US.

Flexible Foam Products is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name FLEXIBLE FOAM PRODUCTS INC except for customer location CHATTANOOGA, TN, US and except for ship-to locations CHATTANOOGA, TN, US and HOUSTON, TX, US.

## **B. High Standard Pad**

High Standard Pad is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name FLEXIBLE FOAM PRODUCTS with a ship-to name HIGH STANDARD PAD INC.

High Standard Pad is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name BURKART FOAM INC with a customer location STEVENSON, AL, US.

High Standard Pad is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell, which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to name HIGH STANDARD PAD. High Standard Pad also is asserting claims for damages based on its purchases of Polyether Polyol

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Products from Lyondell, which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUC with a ship-to location STEVENSON, AL, US.

### **C. Nu-Foam Products**

Nu-Foam is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name NU-FOAM PRODUCTS INC and the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to name NU-FOAM PRODUCTS INC.

Nu-Foam is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name CHEM FLUID SOLUTIONS with a ship-to name NU-FOAM PRODUCTS INC, and the customer name NU-FOAM PRODUCTS, and the customer name FLEXIBLE FOAM PRODUCTS with a customer location CHATTANOOGA, the customer name FLEXIBLE FOAM PRODUCTS with a ship-to name NU-FOAM PRODUCTS INC.

Nu-Foam is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name NU-FOAM PRODUCTS INC, and the customer name THE DOW CHEMICAL COMPANY with a ship-to name NU-FOAM PRODUCTS INC, and the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to location BOYCE, TN, US or a ship to name NU-FOAM PRODUCTS INC.

Nu-Foam is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to name NU-FOAM. Nu-Foam also is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell, which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUC with a ship-to location CHATTANOOGA, TN, US.

Nu-Foam is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name FLEXIBLE FOAM PRODUCTS INC with a customer location CHATTANOOGA, TN, US or a ship-to location CHATTANOOGA, TN, US.

**D. Ohio Decorative Products, Inc., assignee of claims formerly held by Burkart Foam, Inc. (f/k/a Grand Sheet Metal Products, Inc. and Vidrio Products Company)**

Ohio Decorative Products is asserting claims for damages based on Burkart Foam, Inc.’s purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names BURKART FOAM and BURKART FOAM INC.

Ohio Decorative Products is asserting claims for damages based on Burkart Foam, Inc.’s purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name BURKART FOAM INC, and the customer name CHEM FLUID SOLUTIONS with a ship-to name BURKART FOAM INC, and the customer name FLEXIBLE FOAM PRODUCTS with a ship-to name BURKART FOAM INC.

Ohio Decorative Products is asserting claims for damages based on Burkart Foam, Inc.’s purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to name BURKHART FOAM DIV FFP. Ohio Decorative Products also is asserting claims for damages based on Burkart Foam, Inc.’s purchases of Polyether Polyol Products from Lyondell, which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUC with a ship-to location CAIRO, IL, US.

Ohio Decorative Products is asserting claims for damages based on Burkart Foam, Inc.’s purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name BURKART FOAM INC with a customer location CAIRO, IL, US.

**E. Universal Urethanes**

Universal Urethanes is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name UNIVERSAL URETHANES INC.

Universal Urethanes is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to name TRANSMONTAIGNE TERMINALING, or VOPAK TERMINALS NORTH AMERICA. Universal Urethanes also is asserting claims for damages based on its purchases of Polyether

Polyol Products from Dow which are identified in the Dow database by the customer name OHIO DECORATIVE PRODUCTS INC with a ship-to location TEXAS, US.

Universal Urethanes is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUCTS INC with ship-to name UNIVERSAL URETHANES. Universal Urethanes also is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell, which are identified in the Lyondell database by the customer name FLEXIBLE FOAM PRODUC with a ship-to location HOUSTON, TX, US.

Universal Urethanes is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name FLEXIBLE FOAM PRODUCTS INC with a ship-to location HOUSTON, TX, US.

## **FOAM SUPPLIES, INC.**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Company Background**

Plaintiff Foam Supplies, Inc. (“Foam Supplies”) is a Missouri corporation with its principal place of business in Earth City, Missouri. Foam Supplies has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the marine, transportation, construction, food service, manufactured housing, packaging, refrigeration, rotational-molding, furniture, track binder, truck body, and door manufacturing industries.

Foam Supplies purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed and sold. Foam Supplies’ predecessor-in-interest National Polyurethane, Inc. (“National Polyurethane”) was engaged in the purchase of Polyether Polyol Products for sale to and use in the products that Foam Supplies and other companies manufactured, marketed and sold.

### **Scope of Claim**

Foam Supplies is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names FOAM SUPPLIES, FOAM SUPPLIES INC., and FOAM SUPPLIES INC.

Foam Supplies is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name ARCHWAY SALES INC with the ship-to name FOAM SUPPLIES INC and the customer name FOAM SUPPLIES INC.

Foam Supplies is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names FOAM SUPPLIES INC and THE DOW CHEMICAL COMPANY with the ship-to name FOAM SUPPLIES INC.

Foam Supplies is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest National Polyurethane from Dow, which are identified in the Dow database by the customer name NATIONAL POLYURETHANE INC.

Foam Supplies is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names FOAM SUPPLIES INC. and FOAM SUPPLIES INC.

Foam Supplies is asserting claims for damages based on purchases of Polyether Polyol Products made by its predecessor-in-interest National Polyurethane from Huntsman, which are identified in the Huntsman database by the customer names NATIONAL POLYURETHANE INC and NATIONAL POLYURETHANES INC.

Foam Supplies is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer names FOAM SUPPLIES INC and ARCHWAY SALES INC with the ship-to names FOAM SUPPLIES and FOAM SUPPLIES INC.

## **HICKORY SPRINGS MANUFACTURING COMPANY**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Company Background**

Plaintiff Hickory Springs Manufacturing Company is a North Carolina corporation with its principal place of business in Hickory, North Carolina. Hickory Springs has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the furniture, bedding, RV, flooring and carpet pad, construction, automotive, packaging, medical, marine, and telecommunications industries.

Hickory Springs also has been engaged in the purchase of TDI, MDI, and polyols (“Polyether Polyol Products”) for other Hickory Springs companies located in the United States, including, but not limited to, Hickory Springs of California, Inc., Carpet Cushion Company, Inc., and Eastern Foam Products, Inc. Such companies also have been engaged in the marketing, manufacture and sale of products for a variety of industries, including the bedding, furniture, flooring and carpet pad, foam fabrication, and construction industries. Hickory Springs purchased Polyether Polyol Products for use in the products that Hickory Springs, Hickory Springs of California, Inc., Carpet Cushion Company, Inc., and Eastern Foam Products, Inc. have manufactured, marketed and sold.

### **Scope of Claim**

Hickory Springs is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name CARPET CUSHION, the customer name HICKORY SPRINGS MANUFACTURING CO except for purchases identified by the ship-to location HIGH POINT, NC, US, and the customer name HICKORY SPRINGS MFG CO except for purchases identified by the ship-to locations CO KILDARE, IRELAND and MOONE, KD, IRELAND and the ship-to name MOHAWK INDUSTRIES INC.

Hickory Springs is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer names HICKORY SPRINGS MFG CO, HICKORY SPRINGS MFG CO., HICKORY SPRINGS OF CALIF. INC., and CARPET CUSHION CO INC.

Hickory Springs is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names HICKORY SPRINGS MFG CO, HICKORY SPRINGS MANUFACTURING CO, HICKORY SPRINGS OF CALIFORNIA, CARPET CUSHION CO INC, THE DOW CHEMICAL COMPANY with the ship-to name HICKORY SPRINGS MANUFACTURING, and the customer name HICKORY SPRINGS MANUFACTURING except for purchases identified by the ship-to location HIGH POINT, NC, US.

Hickory Springs is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names HICKORY SPRINGS MANUFACTURING, EASTERN FOAM INC, and ZZZ EASTERN FOAM INC.

Hickory Springs is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name HICKORY SPRINGS.

## **HUBER ENGINEERED WOODS LLC AND J.M. HUBER CORPORATION**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Company Background**

Plaintiff Huber Engineered Woods LLC (“Huber”) is an entity organized under the laws of Delaware with its principal place of business in Charlotte, North Carolina. Huber is engaged in the manufacture, marketing, and sales of a wide range of products for residential and commercial construction and industrial applications.

Plaintiff J.M. Huber Corporation (“J.M. Huber”) is a New Jersey Corporation with its principal place of business in Edison, New Jersey. J.M. Huber has been engaged in the manufacture, marketing, and sales of a wide range of products for residential and commercial construction and industrial applications.

Huber purchased MDI and polyols (“Polyether Polyol Products”) for use in the products it has manufactured, marketed and sold. J.M. Huber purchased MDI and polyols (“Polyether Polyol Products”) for use by its Engineered Woods Division (later Huber Engineered Woods LLC) in the products it manufactured, marketed and sold.

### **Scope of Claim**

#### **Huber**

Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name HUBER ENGINEERED WOODS LLC.

Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer name HUBER ENGINEERED WOODS LLC.

Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name HUBER ENGINEERED WOODS LLC.

Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name ZZZ HUBER ENGINEERED WOODS LLC and HUBER ENGINEERED WOODS LLC excluding the ship-to name DLW-METECNO GMBH.

#### **J.M. Huber**

J.M. Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database where the customer name is BASF CANADA INC with the ship-to name J M HUBER CORPORATION and also where the customer name is BASF CANADA INC with the ship-to name J.M. HUBER CORP or J.M. HUBER CORPORATION.

J. M. Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database where the customer name is THE DOW CHEMICAL COMPANY with the ship-to name J M HUBER CORPORATION.

J.M. Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names J M HUBER CORPORATION and J. M. HUBER COMPANY.

J.M. Huber is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name J M HUBER CORP.

## **LEGGETT & PLATT INCORPORATED**

*Carpenter Co., et al. v. BASF SE, et al.*

#### **Company Background**

Plaintiff Leggett & Platt, Incorporated (“Leggett & Platt”) is a Missouri corporation with its principal place of business in Carthage, Missouri. Leggett & Platt has been engaged in the

manufacture, marketing, and sales of products involving a variety of industries, including the furniture, bedding, foam fabrication, and carpet underlay industries.

Leggett & Platt and certain of its predecessors-in-interest and subsidiaries, at various points in time, purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that Leggett & Platt and such companies manufactured, marketed and sold. Such subsidiaries include Leggett & Platt Components Company, Inc., L&P Financial Services Co., Crest-Foam Corp., and Leaving Taos, Inc. Such predecessors-in-interest include Crest-Hood Foam Company, Inc., Crest-Foam Corp., Leggett Partners, L.P., GFC Dura Bond LLC, Met Displays, Inc., No-Sag Foam Products Company, Royal Store Fixtures Corp., The Fairmont Corporation, L&P Products Company, Inc., Southwest Carpet Pad, Inc., and Iredell Fiber, Inc. The subsidiaries and predecessors-in-interest also have been engaged in the manufacture, marketing, and sales of products involving a variety of industries, similar to that of Leggett & Platt.

### **Scope of Claim**

Leggett & Platt is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and certain of its predecessors-in-interest and subsidiaries from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names CREST FOAM CORP, CREST-HOOD FOAM COMPANY INC, P M C INC with the ship-to name GFC DURA BOND LLC, LEGGETT & PLATT, LEGGETT & PLATT (USE ACCT #574373), LEGGETT & PLATT INC, LEGGETT & PLATT INCORPORATED, and NO SAG FOAM.

Leggett & Platt is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and certain of its predecessors-in-interest and subsidiaries from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer names FAIRMONT CORP, HI-LIFE PRODUCTS INC, P M C INC with the ship-to name DURA BOND, LEGGETT & PLATT INC, and CREST-FOAM CORP. except for purchases identified by the customer location MOONACHIE.

Leggett & Platt is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and certain of its predecessors-in-interest and subsidiaries from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names CREST-FOAM CORP, CREST-HOOD FOAM PROD INC, LEGGETT & PLATT INC, LEGGETT & PLATT INC., M P I INC, THE FAIRMONT CORPORATION, NO SAG PRODUCTS, NO-SAG FOAM PRODUCTS, and TEXAS FIBERS INC, the customer name GENERAL FOAM CORPORATION with the ship-to name LEGGETT & PLATT INC., and the

customer name THE DOW CHEMICAL COMPANY with the ship-to names CREST-HOOD FOAM COMPANY INC., LEGGETT & PLATT INC., and MPI.

Leggett & Platt is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and certain of its predecessors-in-interest and subsidiaries from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names HI-LIFE PRODUCTS INC, LEGGETT & PLATT URETHANE DIVISION, MPI - A LEGGETT & PLATT CO, MPI - A LEGGITT & PLATT CO, and ZZZ LEGGETT & PLATT URETHANE.

Leggett & Platt is asserting claims for damages based on purchases of Polyether Polyol Products made by itself and certain of its predecessors-in-interest and subsidiaries from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer names LEGGETT & PLATT, THE FAIRMONT CORPORA, and THE FAIRMONT CORPORATION.

## **LUBRIZOL ADVANCED MATERIALS, INC.**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Company Background**

Plaintiff Lubrizol Advanced Materials, Inc. (f/k/a Noveon, Inc., which was formerly PMD Group Inc. and BFGoodrich Performance Materials, a business unit of B.F. Goodrich Company) (“Lubrizol Advanced Materials”) is a Delaware corporation with its principal place of business in Cleveland, Ohio.

Lubrizol Advanced Materials and its predecessors-in-interest have been engaged or were engaged in the manufacture, marketing, and sales of products involving a variety of industries and applications, including pharmaceuticals, plastics technology and performance coatings. Lubrizol Advanced Materials and its predecessors-in-interest purchased MDI for use in the products that they manufactured, marketed and sold.

### **Scope of Claim**

Lubrizol Advanced Materials (f/k/a Noveon, Inc.), is asserting claims for damages based on its purchases of MDI from BASF Corporation (“BASF”) which are identified in the BASF database by the customer names LUBRIZOL CORPORATION and NOVEON INC.

Lubrizol Advanced Materials (f/k/a Noveon, Inc.) also is asserting claims for damages based on purchases of MDI made by its predecessor-in-interest BFGoodrich Performance Materials from BASF, which are identified in the BASF database by the customer name BF GOODRICH COMPANY.

Lubrizol Advanced Materials (f/k/a Noveon, Inc.) is asserting claims for damages based on its purchases of MDI from Bayer Corporation and Bayer MaterialScience LLC (collectively, “Bayer”), which are identified in the Bayer database by the customer names LUBRIZOL ADVANCED MATERIALS and NOVEON INC.

Lubrizol Advanced Materials (f/k/a Noveon, Inc.) also is asserting claims for damages based on purchases of MDI made by its predecessor-in-interest BFGoodrich Performance Materials from Bayer which are identified in the Bayer database by the customer names B F GOODRICH COMPANY and B. F. GOODRICH COMPANY.

Lubrizol Advanced Materials (f/k/a Noveon, Inc.) is asserting claims for damages based on its purchases of MDI from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name LUBRIZOL ADVANCED MATERIALS.

Lubrizol Advanced Materials (f/k/a Noveon, Inc.) also is asserting claims for damages based on purchases of MDI made by its predecessor-in-interest BFGoodrich Performance Materials from Dow which are identified in the Dow database by the customer names B F GOODRICH CO and THE B F GOODRICH CO.

Lubrizol Advanced Materials is asserting claims for damages based on its purchases of MDI from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names LUBRIZOL ADVANCED MATERIALS INC and NOVEON.

Lubrizol Advanced Materials (f/k/a Noveon, Inc.) also is asserting claims for damages based on purchases of MDI made by its predecessor-in-interest BFGoodrich Performance Materials from Huntsman which are identified in the Huntsman database by the customer name BFGOODRICH COMPANY INC.

## **MARCHEM CORPORATION, MARCHEM SOUTHEAST, INC., and MARCHEM PACIFIC, INC.**

*Dash Multi-Corp., Inc., et al. v. BASF SE, et al.*

## Company Background

Plaintiff MarChem Corporation is a Missouri corporation with its principal place of business in Maryland Heights, Missouri. MarChem has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the automotive, building and construction, filtration, and boating industries. MarChem has purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed and sold.

Plaintiff MarChem Southeast, Inc. (“MarChem Southeast”) is a Georgia corporation with its principal place of business in Adairsville, Georgia. MarChem Southeast has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the automotive, building and construction, filtration, and boating industries. MarChem Southeast has purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed and sold.

Plaintiff MarChem Pacific, Inc. (“MarChem Pacific”) is a California corporation with its principal place of business in Orange, California. MarChem Pacific has been engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the automotive, building and construction, filtration, and boating industries. MarChem Pacific has purchased MDI and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed and sold.

## Scope of Claim

### A. MarChem Corporation

MarChem Corporation is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names DASH MULTI-CORP INC, ARCHWAY SALES CO, ARCHWAY SALES INC, and SEEGOTT INC, all with the ship-to name MARCHEM CORPORATION, and the customer name MARCHEM CORPORATION.

MarChem Corporation is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name MARCHEM CORPORATION with the customer locations MARYLAND HEIGHTS and blank, and the customer name MARCHEM CORPORATION with the customer location MARYLAND HGTS and with the ship-to name MARCHEM CORPORATION.

MarChem Corporation is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name MARCHEM CORP, the customer name MARCHEM CORPORATION with the ship-to name MARCHEM CORPORATION, and the customer name THE DOW CHEMICAL COMPANY with the ship-to name MARCHEM CORPORATION.

MarChem Corporation is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name MARCHEM INCORPORATED.

MarChem Corporation is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer name MARCHEM CORP.

## **B. MarChem Southeast**

MarChem Southeast is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names ARCHWAY SALES CO, ARCHWAY SALES INC, MARCHEM SOUTHEAST INC, MARCHEM SOUTHEAST INC., and SEEGOTT INC, all with the ship-to name MARCHEM SOUTHEAST INC.

MarChem Southeast is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name MARCHEM SOUTHEAST, the customer name MARCHEM CORPORATION with the ship-to name MARCHEM SOUTHEAST, and the customer name MARCHEM CORPORATION with the customer location and ship-to location ADAIRSVILLE, GA, US.

MarChem Southeast is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names MARCHEM SOUTHEAST INC and MARCHEM S E.

MarChem Southeast is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name MARCHEM with the ship-to location ADAIRSVILLE, GA, US.

### **C. MarChem Pacific**

MarChem Pacific is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer names ARCHWAY SALES CO, ARCHWAY SALES INC, and SEEGOTT INC, all with the ship-to name MARCHEM PACIFIC INC, and the customer names MARCHEM PACIFIC and MARCHEM PACIFIC INC.

MarChem Pacific is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name MARCHEM PACIFIC INC and the customer name MARCHEM CORPORATION with the ship-to name MARCHEM PACIFIC INC.

MarChem Pacific is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name MARCHEM PACIFIC INC, the customer name THE DOW CHEMICAL COMPANY with the ship-to name MARCHEM PACIFIC INC, and the customer name MARCHEM CORPORATION with the ship-to name MARCHEM PACIFIC INC.

MarChem Pacific is asserting claims for damages based on its purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer name MARCHEM PACIFIC and the customer name MARCHEM with the ship-to locaton ANAHEIM, CA, US.

## **SKYPARK MANUFACTURING, LLC**

*Carpenter Co., et al. v. BASF SE, et al.*

### **Individual/Company Background**

Plaintiff Skypark Manufacturing, LLP (“Skypark”) was originally organized under the laws of California. Skypark is not currently in operation and has assigned its rights to claims in this litigation to Jorge Burtin. Skypark’s predecessors-in-interest Burtin Urethane Corporation and Burtin Polyurethane, LLC (collectively “Burtin”) were engaged in the manufacture, marketing, and sales of products involving a variety of industries, including the automotive, prosthetics, truckbed lining, recreational sporting balls, building, roofing and construction, filters, heaters, and boating industries. Burtin purchased MDI and polyols (“Polyether Polyol Products”) for use in the products that Burtin manufactured, marketed and sold.

## Scope of Claim

Skypark is asserting claims for damages based on purchases of Polyether Polyol Products made by predecessor-in-interest Burtin from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name BURTIN URETHANE CORPORATION.

Skypark is asserting claims for damages based on purchases of Polyether Polyol Products made by predecessor-in-interest Burtin from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name BURTIN URETHANE CORP.

Skypark is asserting claims for damages based on purchases of Polyether Polyol Products made by predecessor-in-interest Burtin from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer names BURTIN CORP and BURTIN URETHANE CORP, and also before May 2001 where the customer name is BASF with customer code 62941 and with ship-to locations SANTA ANA, CA, US and CARTERSVILLE, GA, US.<sup>356</sup>

Skypark is asserting claims for damages based on purchases of Polyether Polyol Products made by predecessor-in-interest Burtin from Huntsman International LLC (“Huntsman”), which are identified in the Huntsman database by the customer names BURTIN CORP, BURTIN CORP ERSKINE JOHNS, and BURTIN POLYURETHANES.

Skypark is asserting claims for damages based on purchases of Polyether Polyol Products made by predecessor-in-interest Burtin from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer names BURTIN URETHANE CORPORATION and BURTIN URETHANE CORP.

## WOODBRIIDGE FOAM CORPORATION, WOODBRIIDGE HOLDINGS INC., and WOODBRIIDGE SERVICES INC.

*Woodbridge Foam Corporation, et al. v. BASF SE, et al.*

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<sup>356</sup> In or around May 2001, after Burtin’s polyurethanes business was sold to BASF, Dow’s electronic database retroactively changed all of the Burtin purchase records to the name BASF.

## Company Background

Plaintiff Woodbridge Foam Corporation (“Woodbridge Foam”) is a Canadian corporation with its principal place of business in Mississauga, Ontario, Canada. Woodbridge Foam has been engaged in the manufacture, marketing, and sale of products involving a variety of industries, including the automotive, building and construction, protective packaging, insulation, filtration, furniture, and bedding industries. Woodbridge Foam purchased TDI, MDI, and polyols (“Polyether Polyol Products”) for use in the products that it has manufactured, marketed, and sold.

Plaintiff Woodbridge Holdings Inc. (“Woodbridge Holdings”) is a Delaware corporation with its principal place of business in Troy, Michigan. Woodbridge Holdings has been engaged in the purchase of TDI, MDI, and polyols (“Polyether Polyol Products”) for other Woodbridge companies located in the United States, including, but not limited to, Woodbridge Corporation, Woodbridge Foam Fabricating, Inc., Cartex Corporation, Dynaflex Corporation, and SW Foam LLC, as well as for an unrelated United States company Johnson Controls Inc. Such companies have been engaged in the marketing, manufacture and sale of products for a variety of industries, including the automotive, building and construction, protective packaging, insulation, foam fabrication, filtration, furniture, and bedding industries. Woodbridge Holdings purchased Polyether Polyol Products for use in the products that such companies have manufactured, marketed and sold.

Woodbridge Foam and Woodbridge Holdings are hereinafter collectively defined as “Woodbridge North America.”

Plaintiff Woodbridge Services Inc. (“Woodbridge Services”) is a Barbados corporation with its principal place of business in St. Michael, Barbados. Woodbridge Services has been engaged in the purchase of TDI, MDI, and polyols (“Polyether Polyol Products”) for other Woodbridge subsidiaries and joint ventures, such as those located in South America and Australia. Such companies have been engaged in the marketing, manufacture, and sale of products primarily for the automotive industry. Woodbridge Services purchased Polyether Polyol Products for use in the products that other Woodbridge companies have manufactured, marketed, and sold.

## Scope of Claim

### Woodbridge Foam and Woodbridge Holdings

Woodbridge North America is asserting claims for damages based on purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name BASF CANADA with the ship-to names DYNAFLEX PLASTICS,

WOODBRIDGE FOAM CORP, WOODBRIDGE FOAM CORP (PL975), and WOODBRIDGE FOAM CORPORATION, the customer name BASF CANADA INC with the ship-to names WOODBRIDGE FOAM CORP, WOODBRIDGE FOAM CORP (PL975), WOODBRIDGE FOAM CORPORATION, and WOODBRIDGE FOAM CORPORATION, and the customer name BASF CANADA INC. with the ship-to names WOODBRIDGE FOAM CORP, WOODBRIDGE FOAM CORP (PL975), and WOODBRIDGE FOAM CORPORATION, the customer name LYONDELL CHEMICAL COMPANY with the ship-to names WOODBRIDGE FOAM FABRICATING and WOODBRIDGE HOLDINGS CO, and the customer names WOODBRIDGE SALES & ENGINEERING, WOODBRIDGE FOAM FABRICATING, SW FOAM LP, and WOODBRIDGE HOLDINGS INC except for purchases identified by the ship-to names OLYMPIC PRODUCTS, LLC and POLIURETANOS MEXICANOS WOODBRIDGE.

Woodbridge North America is asserting claims for damages based on purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer name BAYER INC with the ship-to names WOODBRIDGE CORP and WOODBRIDGE FOAM CORP, the customer names WOODBRIDGE CORP, WOODBRIDGE CORPORATION, WOODBRIDGE FOAM CORPORATION, WOODBRIDGE FOAM FABRICATION, CARTEX CORPORATION, DYNAFLEX, S W FOAM LP, WOODBRIDGE HOLDINGS INC, and WOODBRIDGE SALES & ENGINEERING, the customer name JOHNSON CONTROLS LTD with the ship-to name WOODBRIDGE FOAM CORP, the customer name WOODBRIDGE FOAM CORP except for purchases identified by the ship-to names POLIURETANOS SW SA DE CV, POLIURETHANOS MEXICANOS, and POLIURETHANOS SUMMA WOODBRIDGE.

Woodbridge North America is asserting claims for damages based on purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name THE DOW CHEMICAL COMPANY with the ship-to names WOODBRIDGE CORPORATION, WOODBRIDGE FOAM CORPORATION, and WOODBRIDGE FOAM FABRICATING, the customer names WOODBRIDGE CORP, WOODBRIDGE FOAM FABRICATING, WOODBRIDGE FOAM FABRICATING INC, CARTEX CORP, CARTEX CORPORATION, DYNAFLEX, WOODBRIDGE HOLDINGS INC, WOODBRIDGE INOAC INC MICHIGAN, and WOODBRIDGE SALES & ENGINEERING, and the customer name WOODBRIDGE CORPORATION except for purchases identified by the ship-to name POLIURETANOS SW DE LEON SA DE and the ship-to location UK, UK.

Woodbridge North America is asserting claims for damages based on purchases of Polyether Polyol Products from Huntsman International LLC (“Huntsman”), which are identified in the

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Huntsman database by the customer names SYST'AM, WOODBRIDGE CORP, WOODBRIDGE CORPORATION, WOODBRIDGE FOAM, WOODBRIDGE FOAM CORP, ZZZ WOODBRIDGE FOAM CORP, DYNAFLEX, WOODBRIDGE HOLDINGS INC, and WOODBRIDGE INOAC INC.

Woodbridge North America is asserting claims for damages based on purchases of Polyether Polyol Products from Lyondell Chemical Company (“Lyondell”), which are identified in the Lyondell database by the customer names WOODBRIDGE HOLDINGS, ARCO CHEMICAL CANADA INC with the ship-to name DYNAFLEX, WOODBRIDGE FOAM CORP, WOODBRIDGE INOAC, and WOODBRIDGE FOAM CORPORATION except for purchases identified by the ship-to names T.W. ESPUMA LTDA. and WOODBRIDGE HENDERSONS.

### **Woodridge Services**

Woodbridge Services is asserting claims for damages based on its purchases of Polyether Polyol Products from BASF Corporation (“BASF”), which are identified in the BASF database by the customer name WOODBRIDGE SERVICES INC.

Woodbridge Services is asserting claims for damages based on its purchases of Polyether Polyol Products from Bayer Corporation and Bayer MaterialScience LLC (collectively “Bayer”), which are identified in the Bayer database by the customer names WOODBRIDGE SERVICES INC and BAYER INC with the ship-to name WOODBRIDGE SERVICES INC.

Woodbridge Services is asserting claims for damages based on its purchases of Polyether Polyol Products from The Dow Chemical Company (“Dow”), which are identified in the Dow database by the customer name WOODBRIDGE SERVICES INC.

Woodbridge Services is asserting claims for damages based on its purchases of Polyether Polyol Products from Lyondell, which are identified in the Lyondell database by the customer name LYONDELL CHEMICAL CANADA INC with the ship-to name WOODBRIDGE SERVICES INC., WOODBRIDGE SERVICES INC, and WOODBRIDGE FOAM CORPORATION with the ship-to names T.W. ESPUMA LTDA. and WOODBRIDGE HENDERSONS.

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## **Appendix D. Materials relied upon**

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As a general principle, I have relied on the materials cited within my report.

## **Electronic purchase data from defendants**

- See Appendix E. for a detailed list of files used to construct the combined transaction database

## **Meet and confer letters**

### **BASF**

- August 9, 2006 Letter from Jason Fliegel to Joseph Goldberg
- March 13, 2007 Letter from Jason Fliegel to Dana Grubescic
- May 4, 2007 Letter from Jason Fliegel to Dana Grubescic
- January 11, 2009 Letter from Jason Fliegel to Jodi Trulove
- June 6, 2010 Letter from Jason Fliegel to Matthew Duncan
- June 30, 2010 Letter from Jason Fliegel to Matthew Duncan
  - Attachment to June 30, 2010 letter.xls
- August 5, 2010 Letter from Jason Fliegel to Matthew Duncan
  - Urethane Product Classification.xls
- March 8, 2011 Letter from Daniel Storino to Doreen Manchester

### **DOW**

- August 14, 2006 Letter from Jeremy Evans to Dana Grubescic
- April 4, 2008 Letter from Jeremy Evans to Joseph Goldberg
- October 10, 2008 Letter from Jeremy Evans to Christopher Cormier
  - Plaintiffs\_ 8.12 Product List Attachment.xls
- July 29, 2010 Letter from Jeremy Evans to Gerard Dever
  - Attachment A.pdf
  - Revised Exhibit 10.pdf
  - TDCC\_PU0179266.xls

- TDCC\_PU0585099.xls
- December 21, 2010 Email from Rachel Saloom to Doreen Manchester
  - 9296 Trade Products with current Business Structure.xls

## **HUNTSMAN**

- 2006.05.08 Answers for initial data request questions.xls (in response to April 13, 2006 data questions)
- March 4, 2010 Letter from Juston Toth to Jodi Trulove
  - Corresponding product technical data sheets
- June 18, 2010 Letter from Juston Toth to Doreen Manchester

## **Technical datasheets and other product classification documents**

### **BASF**

- BASF Corporation US 006215 to BASF Corporation US 006215
- BASF Corporation US 022079 to BASF Corporation US 022079
- BASF Corporation US 034611 to BASF Corporation US 034611
- BASF Corporation US 036486 to BASF Corporation US 036491
- BASF Corporation US 059373 to BASF Corporation US 059420
- BASF Corporation US 0726900 to BASF Corporation US 0726900
- BASF Corporation US 0752031 to BASF Corporation US 0752032
- BASF Corporation US 0767441 to BASF Corporation US 0767441
- BASF Corporation US 0799517 to BASF Corporation US 0799519
- BASF Corporation US 0861416 to BASF Corporation US 0861416
- BASF Corporation US 086271 to BASF Corporation US 086282
- BASF Corporation US 0862875 to BASF Corporation US 0862949
- BASF Corporation US 0890828 to BASF Corporation US 0890828
- BASF Corporation US 0894026 to BASF Corporation US 0894026
- BASF Corporation US 0902258 to BASF Corporation US 0902260

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- BASF Corporation US 0911156 to BASF Corporation US 0911156
- BASF Corporation US 0938088 to BASF Corporation US 0938088
- BASF Corporation US 104430 to BASF Corporation US 104842
- BASF Corporation US 1457107 to BASF Corporation US 1457137
- BASF Corporation US 1769364 to BASF Corporation US 1769577
- BASF Corporation US 1781399 to BASF Corporation US 1781618
- BASF Corporation US 1800931 to BASF Corporation US 1800954
- BASF Corporation US 1800956 to BASF Corporation US 1800968
- BASF Corporation US 288869 to BASF Corporation US 288871
- BASF Corporation US 2963901 to BASF Corporation US 2963904
- BASF Corporation US 2978132 to BASF Corporation US 2978132
- BASF Corporation US 3115635 to BASF Corporation US 3115796
- BASF Corporation US 3205664 to BASF Corporation US 3205665
- BASF Corporation US 3222346 to BASF Corporation US 3222372
- BASF Corporation US 3225353 to BASF Corporation US 3225354
- BASF Corporation US 3287948 to BASF Corporation US 3287948
- BASF Corporation US 3311252 to BASF Corporation US 3311255
- BASF Corporation US 397187 to BASF Corporation US 397187
- BASF Corporation US 4411034 to BASF Corporation US 4411095
- BASF Corporation US 503265 to BASF Corporation US 503265
- BASF Corporation US 503326 to BASF Corporation US 503349
- BASF Corporation US 507556 to BASF Corporation US 507560
- BC 003010 to BC 003018
- Anox 1315 TDS.pdf
- Lupranate 17 MSDS.pdf
- Lupranate 219 TDS.pdf
- Lupranate 223 TDS.pdf

- Lupranate 227 TDS.pdf
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- Lupranate 268\_MSDS.pdf
- Lupranate 273.pdf
- Lupranate 274 TDS.pdf
- Lupranate 276 TDS.pdf
- Lupranate 278 TDS.pdf
- Lupranate 279\_MSDS.pdf
- Lupranate 280 TDS.pdf
- Lupranate 5010 TDS.pdf
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- Lupranate 5050 TDS.pdf
- Lupranate 5060 TDS.pdf
- Lupranate 5070 TDS.pdf
- Lupranate 5080 TDS.pdf
- Lupranate 5090 TDS.pdf
- Lupranate 5100 TDS.pdf
- Lupranate 5143 TDS.pdf
- Lupranate 78 TDS.pdf
- Lupranate 81 TDS.pdf
- Lupranate Isocyanates.pdf
- Lupranate LP27 Info.pdf

- Lupranate LP30\_MSDS.pdf
- Lupranate M TDS.pdf
- Lupranate M10 TDS.pdf
- Lupranate M20 TDS.pdf
- Lupranate M200 TDS.pdf
- Lupranate M20R Info.pdf
- Lupranate M20S TDS.pdf
- Lupranate M50 TDS.pdf
- Lupranate M70L TDS.pdf
- Lupranate M70R TDS.pdf
- Lupranate MI TDS.pdf
- Lupranate MM103 TDS.pdf
- Lupranate MP102 TDS.pdf
- Lupranate MS TDS.pdf
- Lupranate MT TDS.pdf
- Lupranate Polymeric MDI.pdf
- Lupranate Pure MDI.pdf
- Lupranate T80 7525 8020 TDS.pdf
- Lupranate TF2115 TDS.pdf
- Lupranol 2090 Info.pdf
- Lupranol VP 9289 Info.pdf
- Mapeg 200 ML.pdf
- No 218 Iso TDS.pdf
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- No 74 Iso TDS.pdf
- No 78 Iso TDS.pdf
- No 81 Iso TDS.pdf
- Pluracol 1010 TDS.pdf
- Pluracol 1062 TDS.pdf
- Pluracol 1135i TDS.pdf
- Pluracol 1158 TDS.pdf
- Pluracol 1385 TDS.pdf
- Pluracol 1388 TDS.pdf
- Pluracol 1442 TDS.pdf
- Pluracol 1477 TDS.pdf
- Pluracol 1509 TDS.pdf
- Pluracol 1528 TDS.pdf
- Pluracol 1543 TDS.pdf
- Pluracol 1718 TDS.pdf
- Pluracol 2100,2115,2120,2130 TDS.pdf
- Pluracol 355 TDS.pdf
- Pluracol 380 TDS.pdf
- Pluracol 4150A TDS.pdf
- Pluracol 4156 TDS.pdf
- Pluracol 637 TDS.pdf

- Pluracol 718i TDS.pdf
- Pluracol 726 TDS.pdf
- Pluracol 945 TDS.pdf
- Pluracol 973 TDS.pdf
- Pluracol GP 430 TDS.pdf
- Pluracol GP 730 TDS.pdf
- Pluracol P1044 TDS.pdf
- Pluracol P1718 MSDS info.pdf
- Pluracol P2010 TDS.pdf
- Pluracol P220 TDS.pdf
- Pluracol P410R TDS.pdf
- Pluracol P710R TDS.pdf
- Pluracol P726 TDS.pdf
- Pluracol P816 TDS.pdf
- Pluracol PEP 450 TDS.pdf
- Pluracol PEP 550 TDS.pdf
- Pluracol TP 2540 TDS.pdf
- Pluracol TP 4040 TDS.pdf
- Pluracol TP 440 TDS.pdf
- Pluracol TP 740 TDS.pdf
- Pluracol TPE 4542 TDS.pdf

## **BAYER**

- BCPUR0052069 to BCPUR0052083
- BCPUR0052155 to BCPUR0052249
- BCPUR0052279 to BCPUR0052278
- BCPUR0134560 to BCPUR0134579
- BCPUR0134579 to BCPUR0134586

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- BCPUR0160239 to BCPUR0160240
- BCPUR0166214 to BCPUR0166407
- BCPUR0166447 to BCPUR0166450
- BCPUR0169949 to BCPUR0169965
- BCPUR0204868 to BCPUR0204891
- BCPUR0271669 to BCPUR0271671
- BCPUR0272705 to BCPUR0272712
- BCPUR0274377 to BCPUR0274384
- BCPUR0276250 to BCPUR0276261
- BCPUR0471528 to BCPUR0471528
- ACCLAIM.pdf
- ACCUFLEX 1331 MSDS.pdf
- Actaclear ND21A TDS.pdf
- ACTACLEAR.pdf
- Aliphatic Isocyanates.pdf
- Arcol Polyol 700 Info.pdf
- Arcol Polyol E-351 TDS.pdf
- Arcol Polyol E-434 TDS.pdf
- Arcol Polyol F-3022 TDS.pdf
- Arcol Polyol F-3040 TDS.pdf
- Arcol Polyol F-3222 TDS.pdf
- Arcol Polyol HS-100 TDS.pdf
- Arcol Polyol PPG-2000 TDS.pdf
- Arcol Polyol UHS-150 TDS.pdf
- ARCOL POLYOL.pdf
- Arcol PPG-2009.pdf
- Aromatic Isocyanate Product Index.pdf

- BAYDUR263 TDS.pdf
- BAYER CASE products.pdf
- Bayer product index.pdf
- BAYNAT 0759 BX TDS.pdf
- BAYTEC 120 P MSDS.pdf
- BAYTEC 140 P TDS.pdf
- BAYTEC 190 P MSDS.pdf
- BAYTEC 340 P TDS.pdf
- BAYTEC 390 P TDS.pdf
- BAYTEC 55 P TDS.pdf
- BAYTEC MP 210 MSDS.pdf
- BAYTEC MP 230 MSDS.pdf
- DESMODUR Grade Names.pdf
- DESMODUR VL TDS.pdf
- Hyperlite e-824 TDS.pdf
- Hyperlite e-837 TDS.pdf
- Hyperlite e-839 TDS.pdf
- Hyperlite e-849 TDS.pdf
- Hyperlite e-850 TDS.pdf
- Hyperlite e-851 TDS.pdf
- Hyperlite e-852 TDS.pdf
- Hyperlite e-863 TDS.pdf
- HYPERLITE.pdf
- MONDUR 1441 MSDS.pdf
- MONDUR 1453 MSDS.PDF
- MONDUR 1453 TDS.pdf
- Mondur 1515 TDS.pdf

- Mondur 1522 TDS.pdf
- Mondur 448 TDS.pdf
- Mondur 489 TDS.pdf
- Mondur 501 TDS.pdf
- Mondur 541 Lite TDS.pdf
- MONDUR 541 TDS.pdf
- Mondur 582 TDS.pdf
- Mondur CD TDS.pdf
- Mondur M (flaked) TDS.pdf
- Mondur ML TDS.pdf
- MONDUR MR Info.pdf
- Mondur MR Lite TDS.pdf
- Mondur MR TDS.pdf
- Mondur MR-5 TDS.pdf
- Mondur MRS TDS.pdf
- Mondur MRS-2 TDS.pdf
- Mondur MRS-4 TDS.pdf
- Mondur MRS-5 TDS.pdf
- Mondur PC TDS.pdf
- Mondur PF TDS.pdf
- Multranol 3901 TDS.pdf
- Multranol 4035 TDS.pdf
- Multranol 8162 TDS.pdf
- Multranol 8206 TDS.pdf
- Multranol 8236 TDS.pdf
- Multranol 9139 TDS.pdf
- Multranol 9242 TDS.pdf

- MULTRANOL.pdf
- Product Groups Overview.pdf
- Product Index.pdf
- Softcell VE 1100 TDS.pdf
- Ultracel U3000 TDS.pdf

## DOW

- TDCC\_PU0485548 to TDCC\_PU0485551
- TDCC\_PU0491371 to TDCC\_PU0491371
- TDCC\_PU0516578 to TDCC\_PU0516928
- TDCC\_PU0534235 to TDCC\_PU0534244
- TDCC\_PU0585099 to TDCC\_PU0585111
- TDCC\_PU0670547 to TDCC\_PU0670563
- TDCC\_PU0677841 to TDCC\_PU0677870
- TDCC\_PU0792167 to TDCC\_PU0792213
- TDCC\_PU0840621 to TDCC\_PU0840644
- TDCC\_PU0842584 to TDCC\_PU0842644
- TDCC\_PU1036371 to TDCC\_PU1036484
- TDCC\_PU1069863 to TDCC\_PU1069863
- TDCC\_PU1141280 to TDCC\_PU1141475
- TDCC\_PU1199769 to TDCC\_PU1199769
- TDCC\_PU1356558 to TDCC\_PU1356561
- TDCC\_PU1389610 to TDCC\_PU1389611
- TDCC\_PU1420282 to TDCC\_PU1420315
- TDCC\_PU1451805 to TDCC\_PU1451805
- TDCC\_PU1452588 to TDCC\_PU1452589
- TDCC\_PU1452590 to TDCC\_PU1452591
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- SPECTRIM BP80 MSDS.pdf
- VORACOR CE 108 MSDS.pdf
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- VORANOL 2070 TDS.pdf
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- VORANOL 415 TDS.pdf
- VORANOL POLYOL.pdf
- VORANOL VORALUX SPECFLEX.pdf
- VORASTAR HB 6042 TDS.pdf

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- HC000119142 to HC000119182
- HC000152511 to HC000152530
- HC000182057 to HC000182058
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- HC000716050 to HC000716060
- HC000785882 to HC000785895
- HC000940844 to HC000940844
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- Surfactant product line.pdf

### **Capacity data sources**

- V.A Dow - TDCC\_PU1804711.xls
- Defendant The Dow Chemical Company's First Supplemental Response to Direct Action Plaintiffs' Second Set of Interrogatories to all Defendants, Exhibit A, Oct. 8, 2010
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BAG/PUR-0000066	BAG/PUR-0000181
BASF Corporation US 046838	BASF Corporation US 046845
BASF Corporation US 0702331	BASF Corporation US 0702332
BASF Corporation US 0778686	BASF Corporation US 0778693
BASF Corporation US 104399	BASF Corporation US 104403
BASF Corporation US 107536	BASF Corporation US 107536
BASF Corporation US 1105691	BASF Corporation US 1105691
BASF Corporation US 1128269	BASF Corporation US 1128272
BASF Corporation US 1128281	BASF Corporation US 1128282
BASF Corporation US 1128335	BASF Corporation US 1128343
BASF Corporation US 1391381	BASF Corporation US 1391442
BASF Corporation US 1391392	BASF Corporation US 1391392
BASF Corporation US 164353	BASF Corporation US 164358
BASF Corporation US 169040	BASF Corporation US 169060
BASF Corporation US 169059	BASF Corporation US 169059
BASF Corporation US 1800958	BASF Corporation US 1800958
BASF Corporation US 1800965	BASF Corporation US 1800965
BASF Corporation US 22226	BASF Corporation US 22229
BASF Corporation US 2731252	BASF Corporation US 2731252
BASF Corporation US 2886765	BASF Corporation US 2886765
BASF Corporation US 3115616	BASF Corporation US 3115616
BASF Corporation US 3332937	BASF Corporation US 3332937
BASF Corporation US 4441085	BASF Corporation US 4441086
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BASF Corporation US 4445781	BASF Corporation US 4445781
BASF Corporation US 4445796	BASF Corporation US 4445796
BASF Corporation US 4445807	BASF Corporation US 4445807
BASF Corporation US 4445908	BASF Corporation US 4445908
BASF Corporation US 4448746	BASF Corporation US 4448746
BASF Corporation US 4448776	BASF Corporation US 4448779
BASF Corporation US 4458623	BASF Corporation US 4458624
BASF Corporation US 4463102	BASF Corporation US 4463102
BASF Corporation US 44741664	BASF Corporation US 44741664
BASF Corporation US 458206	BASF Corporation US 458206
BASF Corporation US 463558	BASF Corporation US 463575
BASF Corporation US 477706	BASF Corporation US 477706

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PROTECTIVE ORDER IN IN RE URETHANE ANTITRUST LITIGATION  
MDL NO. 1616

First Bates Number	Last Bates Number
BASF Corporation US 477742	BASF Corporation US 477745
BASF Corporation US 477746	BASF Corporation US 477746
BASF Corporation US 477750	BASF Corporation US 477750
BASF Corporation US 477754	BASF Corporation US 477754
BASF Corporation US 477756	BASF Corporation US 477763
BASF Corporation US 493242	BASF Corporation US 493242
BASF Corporation US 503265	BASF Corporation US 503265
BASF Corporation US 507737	BASF Corporation US 507737
BASF Corporation US 638542	BASF Corporation US 638543
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BC/PUR0067797	BC/PUR0067803
BC/PUR0074724	BC/PUR0074724
BC/PUR0076719	BC/PUR0076719
BC/PUR0110056	BC/PUR0110057
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BC/PUR0276256	BC/PUR0276256
BC/PUR0293634	BC/PUR0293634
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BC/PUR0432077	BC/PUR0432077
BC/PUR0432100	BC/PUR0432100
BC/PUR0450203	BC/PUR0450203
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FSI_000000163	FSI_000000163

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HC008178997	HC008178997
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HC013855687	HC013855689
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LPI_000097775	LPI_000097775
LPI_000097777	LPI_000097777
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PUWG-00000918	PUWG-00000918
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TDCC_PU0443918	TDCC_PU0443918
TDCC_PU0585107	TDCC_PU0585107

CONTAINS HIGHLY CONFIDENTIAL INFORMATION SUBJECT TO  
PROTECTIVE ORDER IN IN RE URETHANE ANTITRUST LITIGATION  
MDL NO. 1616

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TDCC_PU1422747	TDCC_PU1422747
TDCC_PU184427	TDCC_PU184427
TDCC_PU240792	TDCC_PU240792
TDCC_PU392974	TDCC_PU392974
TDCC_PU392975	TDCC_PU392975
TDCC_PU393796	TDCC_PU393796
TDCC_PU429312	TDCC_PU429312

## Legal documents and deposition testimony

### Complaints

- Carpenter Co., et al v. BASF SE, et al., Civil Action No. 08-2617 (D. Kan.)
- Dash Multi-Corp, Inc., et al. v. BASF SE, et al., Civil Action No. 10-2077 (D. Kan.)
- Woodbridge Foam Corporation, et al. v. BASF SE, et al., Civil Action No. 09-2026 (D. Kan.)

### Written discovery responses

- Direct Action Plaintiffs' Collective Amended and Supplemental Responses to Defendants' First Set of Merits Interrogatories (Corrected Version 12/21/10), filed December 21, 2010
- Defendant BASF Corporation's Responses and Objections to Direct Action Plaintiffs' Second Set of Interrogatories to All Defendants, filed August 2, 2010
- Defendant The Dow Chemical Company's Response to Direct Action Plaintiffs' Second Set of Interrogatories to All Defendants, filed August 2, 2010
- Huntsman International LLC's Objections and Answers to the Direct Action Plaintiffs' Second Set of Interrogatories Directed to All Defendants, filed August 2, 1010
- Letter from Jeremy Evans to Gerard Dever and Doreen Manchester, "Re: In re Urethanes Antitrust Litigation," dated July 29, 2010

### Declarations

- Declaration of Charles L. Miller Jr., submitted on October 6, 2009, in the matter of *In Re Urethane Antitrust Litigation*
- Declaration of Charles L. Miller Jr., submitted on September 30, 2010, in the matter of *In Re Urethane Antitrust Litigation*

## Defendant depositions

### **BASF**

- December 17, 2009 Deposition of Larry Berkowski
- May 6, 2010 Deposition of William Lizzi
- May 26, 2010 Deposition of John Feldmann
- June 7, 2010 Deposition of Uwe Hartwig
- June 8, 2010 Deposition of Uwe Hartwig
- June 10, 2010 Deposition of Jean-Pierre Dhanis
- June 11, 2010 Deposition of Jean-Pierre Dhanis
- June 23, 2010 Deposition of Gary Liebbe
- July 26, 2010 Deposition of Christopher Rieker
- August 17, 2010 Plaintiffs' Written Deposition Questions for Christian Buhse
- September 7, 2010 Plaintiffs' Written Deposition Questions for Christian Buhse
- September 22, 2010 Deposition of Roger Huarng
- October 6, 2010 Written Deposition Responses of Christian Buhse
- October 26, 2010 Deposition of Richard Mericle
- October 28, 2010 Deposition of Robert Lawrence
- November 9, 2010 Deposition of Kenneth Lane (30(b)(6))
- November 10, 2010 Deposition of Kenneth Lane (30(b)(6))

### **Bayer**

- September 23, 2009 Deposition of John Phelps
- September 24, 2009 Deposition of John Phelps
- October 15, 2009 Deposition of Gerald Phelan
- November 2, 2009 Deposition of Lawrence Stern
- July 21, 2010 Deposition of Michelle Blumberg
- September 16, 2010 Deposition of Lee Noble

### **Dow**

- March 9, 2010 Deposition of Patrick Dawson

- April 30, 2010 Deposition of David Fischer
- May 5, 2010 Deposition of Phillip Cook
- May 21, 2010 Deposition of Marco Levi
- September 14, 2010 Deposition of Stephanie Barbour
- September 15, 2010 Deposition of Stephanie Barbour
- November 5, 2010 Deposition of William Long
- December 1, 2010 Deposition of Thomas Feige, Jr. (30(b)(6))
- December 2, 2010 Deposition of Thomas Feige, Jr. (30(b)(6))
- January 12, 2011 Deposition of Charles Churet

#### **Huntsman**

- November 12, 2009 Deposition of Gregory Geaman
- January 13, 2010 Deposition of Steven Hostetter
- February 4, 2010 Deposition of Anthony Hankins
- February 5, 2010 Deposition of Anthony Hankins
- February 18, 2010 Deposition of Peter Huntsman
- April 15, 2010 Deposition of Gregory Pelts
- June 9, 2010 Deposition of Keith Day
- July 8, 2010 Deposition of Steven Hubrecht
- November 30, 2010 Deposition of Gregory Geaman (30(b)(6))

#### **Deposition exhibits**

- Ex. 37
- Ex. 1373
- Ex. 1492-93
- Ex. 1521
- Ex. 1527-28
- Ex. 1593
- Ex. 1608-09

- Ex. 1925
- Ex. 4125–26
- Ex. 4131
- Ex. 4368
- Ex. 4369
- Ex. 4370
- Ex. 4378
- Ex. 4671
- Ex. 5302–08
- Ex. 5306
- Ex. 5308
- Ex. 5309
- Ex. 5328
- Ex. 5566
- Ex. 5580
- Ex. 5671
- Ex. 5673
- Ex. 5675
- Ex. 5677
- Ex. 5691
- Ex. 5702
- Ex. 5932
- Ex. 5933
- Ex. 5936
- Ex. 5940
- Ex. 5941
- Ex. 5946

- Ex. 7000
- Ex. 7085
- Ex. 7502

## Plaintiff depositions

### Leggett & Platt

- Final Transcript of February 23, 2010 Deposition of Joseph York

### Lubrizol

- Final Transcript of August 11, 2010 Deposition of John Quackenbush

### Skypark Manufacturing LLC

- Final Transcript of January 27, 2010 Deposition of Jorge Burtin

### Vitafoam

- Final Transcript of June 29, 2010 Deposition of Martin Cosgrove

### Woodbridge

- Final Transcript of July 21, 2010 Deposition of Bruce O'Brien

## Publicly available data

Series Name	Source
10-Year Treasury Constant Maturity Rate	Federal Reserve Economic Data
Ammonia (In U.S. Gulf Spot FOB USG)	ICIS Pricing
Appliances, Carpeting, and Furniture IPI	Federal Reserve Economic Data
Average Weekly Earnings for Production and Non-Supervisory Employees in the Chemical Manufacturing Industry	The Bureau of Labor Statistics
Benzene (In U.S. Gulf Spot FOB Barges)	ICIS Pricing
Canada/U.S. Foreign Exchange Rate	Federal Reserve Economic Data
Carpeting and Furniture IPI	Federal Reserve Economic Data
Chlorine Index (Compressed or Liquefied)	The Bureau of Labor Statistics
Ethylene (In U.S. Gulf Spot Del Pipeline)	ICIS Pricing
Methanol (In US Gulf Spot DOM Barge)	ICIS Pricing
New Privately Owned Housing Units Started	US Census Bureau
Propylene (C Grade, In U.S. Gulf Spot Pipeline)	ICIS Pricing
Toluene (C Grade, In U.S. Gulf Spot FOB Barges)	ICIS Pricing
Total Motor Vehicle Assemblies	Federal Reserve Economic Data
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## 10-Ks and annual reports

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- Huntsman International LLC, Form 10-K for the year ending Dec. 31, 2003
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- Huntsman International LLC, Form 10-K for the year ending Dec. 31, 2009
- Lyondell Chemical Company, Form 10-K for the year ending Dec. 31, 2004
- Lyondell Chemical Company, Form 10-K for the year ending Dec. 31, 2007
- The Dow Chemical Company, Form 10-K for the year ending Dec. 31, 2009

## Other antitrust litigation

- Expert Report of D. Bernheim submitted on May 24, 2002, in the matter of *In Re Vitamins Antitrust Litigation*
- *In Re Industrial Silicon Antitrust Litigation*, 1998 U.S. Dist. LEXIS 20464 at 2 (W.D. Pa. 1998)
- *In re Linerboard Antitrust Litigation* (2007 U.S. Dist. LEXIS 55330 (E.D.P.A. 2007))
- *In re Polypropylene Carpet Antitrust Litigation*, 93 F. Supp. 2d 1348 (N.D. Ga. 2000)
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- *Midwest Machinery v. Northwest Airlines, Inc.*, 2001 U.S. Dist. LEXIS 15677 at 2 (D. Minn. 2001)

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- Westervelt, Robert, "Dow to Build US TDI Plant; Miles is Still Committed to US Project," *Chemical Week*, February 22, 1995

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- "Lyondell to Permanently Cease TDI Production at Lake Charles Plant," Lyondell News Release, October 19, 2005 <<http://lyondellbasell.mediaroom.com/index.php?s=43&item=165>>
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- BASF – BASF at a Glance <<http://www.bASF.com/group/corporate/en/about-bASF/index?mid=0>>
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- BASF Corporation – About Us <<http://www2.bASF.us/corporate/aboutbasfindex.html>>
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BASF Corp US 003448	BASF Corp US 003448
BASF Corp US 017813	BASF Corp US 017813
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- "Basic Chemical Price Watch," *Chemical Week*, March 9, 2005
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- "Huntsman seeks 8 cent/lb MDI, 10 cent/lb polyol hikes," *Chemical News & Intelligence*, October 3, 2005
- "Dow Chemical to hike prices for PU raw materials; polyurethane," *Rubber & Plastics News*, October 10, 2005
- "Dow, BASF seek 10-cent November hike on US polyols," *Chemical News & Intelligence*, October 17, 2005
- Sim, Peck Hwee, "TDI Shortage Prompts Record Price Increases," *Chemical Week*, October 26, 2005
- "BASF Ups PU Increases," *Chemical Week*, November 16, 2005
- "Dow seeks April price hikes for Euro polyols, TDI," *Chemical News & Intelligence*, March 8, 2006
- "Dow seeks European polymer price hikes," *Chemical News & Intelligence*, May 23, 2006
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- "Basic Chemical Price Watch," *Chemical Week*, June 21, 2006
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- "Huntsman plans MDI price hikes in Americas," *Chemical News & Intelligence*, July 31, 2006
- "Basic Chemical Price Watch," *Chemical Week*, August 9, 2006
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## **Appendix E. Data processing**

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## Overview

I received polyurethane chemical sales data from Defendants BASF, Dow, Huntsman, and Lyondell and also from co-conspirator Bayer. I created a combined transaction database from these data. This combined transaction database contained Defendant-provided purchase records for the direct action plaintiffs, class plaintiffs, and other entities. The following Defendant-provided data were used in the creation of the combined transaction database:

**Figure 67 Defendant-provided data for TDI, MDI, and polyether polyols**

Dataset	Total US sales amount to class and direct action plaintiffs <sup>357</sup>	Total number of sales records for class and direct action plaintiffs	Time coverage
BASF	\$6,783,382,514	187,135	1992–2008
Bayer	\$13,800,279,863	691,811	1992–2008
Dow	\$8,442,569,655	214,458	1992–2008
ICI/Huntsman	\$6,168,956,843	307,659	1993–2008
Lyondell	\$2,736,987,328	203,070	1994–2005
<b>Total</b>	<b>\$37,932,176,203</b>	<b>1,604,133</b>	

Source: Combined transaction database

In the course of combining the data listed above, I undertook a process to standardize the data fields most relevant to performing my analysis. In particular, I standardized purchaser names, product names, location information, transaction dates, transaction amounts, transaction quantities, and transaction prices.

Both bill-to and ship-to names were considered during the standardization of purchaser names. I identified each record in the database as a purchase made by a direct action plaintiff, class plaintiff, or Defendant/co-conspirator. Direct action plaintiff purchases were identified by following specific instructions from counsel (see Appendix C).

I also standardized product characteristics for each transaction. I created a standard product name (e.g., Rubinate M) to group identical products together.<sup>358</sup> I also created a standard product family field (e.g., MDI) and standard product class field (e.g., Polymeric MDI, CFS polyol) based on product specification sheets from discovery documents, descriptive fields provided by the

<sup>357</sup> Lyondell polyol sales to non-Plaintiffs in 1994, 1996, and 1997 are not contained in this figure. See footnote 363.

<sup>358</sup> This process cleaned typos and other idiosyncrasies in the reporting of product names in the data.

Defendants in their data, and Defendant websites. I also took care to remove products other than TDI, MDI, and polyether polyols from my analysis.<sup>359</sup>

The location for each transaction was also identified. I was instructed to calculate overcharges on purchases made by Plaintiffs and their predecessors-in-interest in the United States. Some datasets contained a bill-to location and ship-to location. Purchases were identified as “US” if either one of these fields contained a location in the United States or else otherwise instructed by counsel as described in Appendix C.<sup>360</sup>

The date of each transaction was identified and standardized using the date of the invoice found in the data. If the invoice date was missing, the date of shipment was used for the transaction date.

For each dataset used to create the combined transaction database, I excluded freight charges where possible. I also incorporated rebates, discounts, and returns with their original transactions where record identifiers were present that allowed me to make this calculation. Where available, I created a net amount or used the net amount field provided in the databases. I also standardized the database quantities to pounds where possible.

Below I discuss the processing for each company’s dataset.

## BASF

**Figure 68 Original sales and related files received from BASF**

File	Bates number	Description
BASF Corporation US 4492853 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4492853	01/92-12/93 MDI sales data
BASF Corporation US 4492855 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4492855	01/92-12/93 TDI sales data
BASF Corporation US 4492854 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4492854	01/92-12/93 Polyols sales data
BASF Corporation US 4493149 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4493149	01/92-12/93 Systems sales data
BASF Corporation US 4493147 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4493147	01/92-12/93 Systems sales data
BASF Corporation US 4493148 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4493148	01/92-12/93 Systems sales data

<sup>359</sup> I was not instructed to analyze prepolymers, polyester polyols, systems, and other non-relevant products in the data.

<sup>360</sup> Some of these purchases were delivered to regions outside the United States.

File	Bates number	Description
BASF Corporation US 4481506 - Highly Confidential - 3rd Party Sales MDI 1994 - 1996.xls	BASF Corporation US 4481506	01/94-12/96 MDI sales data
BASF Corporation US 4481507 - Highly Confidential - 3rd Party Sales TDI 1994 - 1996.xls	BASF Corporation US 4481507	01/94-12/96 TDI sales data
BASF Corporation US 4481508 - Highly Confidential - 3rd Party Sales Polyol 1994 - 1996.xls	BASF Corporation US 4481508	01/94-12/96 Polyols sales data
BASF Corporation US 4492856 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4492856	01/94-12/96 Systems sales data
BASF Corporation US 4492858 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4492858	01/94-12/96 Systems sales data
BASF Corporation US 4492857 - Highly Confidential - 3rd Part.xls	BASF Corporation US 4492857	01/94-12/96 Systems sales data
BASF Corporation US Highly Confidential 4481333 - BPFE Sales.xls	BASF Corporation US 4481333	01/04-12/04 Foam Enterprise sales data
BC 023770 Highly Confidential - Basic Sales - Third Party Polyol.xls	BC 023770	01/98-12/05 Polyols sales data
BC 023769 Highly Confidential - Basic Sales - Third Party MDI.xls	BC 023769	01/98-12/05 MDI sales data
BC 023771 Highly Confidential - Basic Sales - Affiliates.xls	BC 023771	01/98-12/05 TDI, MDI, and Polyols sales data
BC 023772 Highly Confidential - Basic Sales - Codefendants.xls	BC 023772	01/98-12/05 TDI, MDI, and Polyols sales data
BC 023774 Highly Confidential - System Sales - Third Party.xls	BC 023774	01/98-12/05 Systems sales data
Colliding Customer List.xls	N/A	List of customers that change name/location
BC 023768 Highly Confidential - Basic Sales - Third Party TDI.xls	BC 023768	01/98-12/05 TDI sales data
BC 023775 Highly Confidential - System Sales - Debit Credit.xls	BC 023775	01/00-12/05 Systems credit and debit data
BC 023773 Highly Confidential - Basic Sales - Debit Credit.xls	BC 023773	01/00-12/06 TDI, MDI, and Polyols credit and debit data
BASF Corporation US Highly Confidential 507731 - Basic Sales - Affiliates II.xls	BASF Corporation US 507731	01/08-12/08 TDI, MDI, and Polyols sales data
BASF Corporation US Highly Confidential 507721 - Basic Sales - Third Party TDI II.xls	BASF Corporation US 507721	01/97-12/97 & 01/06-12/08 TDI sales data
BASF Corporation US Highly Confidential 507722 - Basic Sales - Third Party MDI II.xls	BASF Corporation US 507722	01/97-12/97 & 01/06-12/08 MDI sales data
BASF Corporation US Highly Confidential 507723 - Basic Sales - Third Party Polyol II.xls	BASF Corporation US 507723	01/97-12/97 & 01/06-12/08 Polyols sales data
BASF Corporation US Highly Confidential 507724 - Systems Sales - Third Party II.xls	BASF Corporation US 507724	01/97-12/97 & 01/06-12/08 Systems sales data
BASF Corporation US Highly Confidential 507725 - BPFE Sales - Third Party II.xls	BASF Corporation US 507725	01/05-12/08 Foam Enterprise sales data
BASF Corporation US Highly Confidential 507726 - Basic Sales - Debit Credit II.xls	BASF Corporation US 507726	01/06-12/08 TDI, MDI, and Polyols credit and debit data
BASF Corporation US Highly Confidential 507727 - Systems Sales - Debit Credit II.xls	BASF Corporation US 507727	01/06-12/08 Systems credit and debit data
BASF Corporation US Highly Confidential 507728 - Basic Sales - Co-defendants II.xls	BASF Corporation US 507728	01/97-12/97 & 01/06-12/08 TDI, MDI, and Polyols sales data

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File	Bates number	Description
BASF Corporation US Highly Confidential 507729 - Basic Sales - Affiliates IIa.xls	BASF Corporation US 507729	01/97-12/97 & 01/06-12/06 TDI, MDI, and Polyols sales data
BASF Corporation US Highly Confidential 507730 - Basic Sales - Affiliates IIb.xls	BASF Corporation US 507730	01/07-12/07 TDI, MDI, and Polyols sales data

## Data processing

The BASF files listed above (excluding “Colliding Customer List.xls”) were appended together. No duplicate records were identified in the database.

These data provided ship to customer (“Ship\_to\_Name\_1\_Txt”) and bill to customer name (“Payer\_Name\_1\_Txt”) information. Names in both these fields were flagged as direct action plaintiff purchases, class plaintiff purchases, or defendant purchases. The plaintiffs in the direct action group were identified at the direction of counsel (see Appendix C).

The field called “Material\_Desc\_Txt” was used to identify products in the BASF database. Discovery documents, technical data sheets from BASF’s website, and also the fields “Product\_Group\_Cd” and “DW\_PROFIT\_CENTER\_NO” found in the data were used to classify products.

The ship to location fields (“Ship To City”, “Ship\_to\_Region\_Cd”, “Ship To Country”, and “Order\_Destination\_Country\_Cd”) and bill to location fields (“Payer City”, “Payer State”, and “Payer Country”) were used to identify the location of these transactions.

The date of each transaction was identified using the invoice date found in the field “Billing\_Document\_Dt”. When the invoice date was missing, the date of the transaction was set equal to the ship date found in the field “Actual\_Goods\_Issue\_Dt”.

The BASF data contained the net amount field “SumOfNet\_Sale\_Amt”. Freight was not included in the net amount field (according to BASF correspondence). The quantity field (“SumOfUniform\_UOM\_Sales\_Qty”) was standardized to pounds where possible using the unit of measure found in the field “Uniform\_Sales\_Qty\_UOM\_Cd”.

Returns and other adjustment records were linked to the original invoice records in the 1992-1993, per BASF’s instruction, based on “Payer\_Name\_1\_Txt,” “Material\_Desc\_Txt,” “Billing\_Document\_Dt,” and “Billing\_Document\_No” fields. It was not possible to systematically link adjustment records with original invoice records for the 1994-2008 time period.

## BAYER

**Figure 69 Original sales and related files received from BAYER**

File	Bates number	Description
Jones Day MDI, PET, TDI July-Aug 04.xls	N/A	07/04-08/04 TDI, MDI, and Polyols sales data
Jones Day MDI, PET, TDI Sept-Dec 2004.xls	N/A	09/04-12/04 TDI, MDI, and Polyols sales data
Copy of Jones Litigation 3.mdb	N/A	01/94-06/04 TDI, MDI, and Polyols sales data
2005 Sales Detail Jan-Mar.xls	N/A	01/05-03/05 TDI, MDI, and Polyols sales data
2005 Sales Detail Apr-Jun.xls	N/A	04/05-06/05 TDI, MDI, and Polyols sales data
2005 Sales Detail Jul-Sep.xls	N/A	07/05-09/05 TDI, MDI, and Polyols sales data
2005 Sales Detail Oct-Dec.xls	N/A	10/05-12/05 TDI, MDI, and Polyols sales data
2006 Sales Detail Apr-Jun.xls	N/A	04/06-06/06 TDI, MDI, and Polyols sales data
2006 Sales Detail Jan-Mar.xls	N/A	01/06-03/06 TDI, MDI, and Polyols sales data
2006 Sales Detail Jul-Sep.xls	N/A	07/06-09/06 TDI, MDI, and Polyols sales data
2006 Sales Detail Oct-Dec.xls	N/A	10/06-12/06 TDI, MDI, and Polyols sales data
2007 Sales Detail Apr-Jun.xls	N/A	04/07-06/07 TDI, MDI, and Polyols sales data
2007 Sales Detail Jan-Mar.xls	N/A	01/07-03/07 TDI, MDI, and Polyols sales data
2007 Sales Detail Jul-Sep.xls	N/A	07/07-09/07 TDI, MDI, and Polyols sales data
2007 Sales Detail Oct-Dec.xls	N/A	10/07-12/07 TDI, MDI, and Polyols sales data
2008 Sales Detail Apr-Jun.xls	N/A	04/08-06/08 TDI, MDI, and Polyols sales data
2008 Sales Detail Jan-Mar.xls	N/A	01/08-03/08 TDI, MDI, and Polyols sales data
2008 Sales Detail Jul-Sep.xls	N/A	07/08-09/08 TDI, MDI, and Polyols sales data
2008 Sales Detail Oct-Dec.xls	N/A	10/08-12/08 TDI, MDI, and Polyols sales data
Jones Day 1992 - 1996.mdb	N/A	01/92-12/96 TDI, MDI, and Polyols sales data

### Data processing

The Bayer files listed above were appended together. Some records in the files "Copy of Jones Litigation 3.mdb" and "Jones Day 1992 - 1996.mdb" were found to be duplicative and were disregarded. Additional duplicate records were found within the file "Copy of Jones Litigation 3.mdb" and were also disregarded.

These data provided ship to customer ("SHIPNAME") and bill to customer name ("BILLNAME") information. Names in both these fields were flagged as direct action plaintiff purchases, class plaintiff purchases, or defendant purchases. The plaintiffs in the direct action group were identified at the direction of counsel (see Appendix C).

The field called "LABEL" was used to identify products in the Bayer database. Discovery documents, technical data sheets from Bayer's website, and also the field "H3NAME" found in the data were used to classify products.

The ship to location fields (“SHIPCITY”, “SHIPSTAT”, and “SHIPCNTY”) and bill to location fields (“BILLCITY”, “BILLSTAT”, and “BILLCNTY”) were used to identify the location of these transactions.

The date of each transaction was identified using the invoice date found in the field “INVDATE”. When the invoice date was missing, the date of the transaction was set equal to the ship date found in the field “SHIPDATE”.

Net purchase amounts in the Bayer data were calculated by subtracting the rebate field (“REBATE”) from the gross amount field (“JEAMT”). The quantity field (“JEQTY”) was standardized to pounds in the July 2004 through December 2004 time period as these data contained quantities expressed in kilograms.

There were no record indicators that allowed for the linking of adjustment records to original invoice transactions for the 1992-2008 time period.

## DOW

**Figure 70 Original sales and related files received from DOW**

File	Bates number	Description
98-05 Poly Request updated.xls	N/A	Sales of polyether polyol Systems products from 98-05 by TDCC North American Systems House business
TDCC_PU0161281.xls	TDCC_PU0161281	Certain rebate transactions from 2001-2005 for TDI, MDI, and Polyols
TDCC_PU0163285.xls	TDCC_PU0163285	1999 sales of TDI, MDI, and Polyols
TDCC_PU0161305.xls	TDCC_PU0161305	1998 sales of TDI, MDI, and Polyols
TDCC_PU0165202.xls	TDCC_PU0165202	2000 sales of TDI, MDI, and Polyols
TDCC_PU0167002.xls	TDCC_PU0167002	2001 sales of TDI, MDI, and Polyols
TDCC_PU0168550.xls	TDCC_PU0168550	2002 sales of TDI, MDI, and Polyols
TDCC_PU0170008.xls	TDCC_PU0170008	2003 sales of TDI, MDI, and Polyols
TDCC_PU0171958.xls	TDCC_PU0171958	2004 sales of TDI, MDI, and Polyols
TDCC_PU0173947.xls	TDCC_PU0173947	2005 sales of TDI, MDI, and Polyols
TDCC_PU0175657.xls	TDCC_PU0175657	1998-2005 Sales of Systems products sold by Dow Automotive
TDCC_PU0179248.xls	TDCC_PU0179248	Certain rebate transactions from 2001-2005 for Systems products sold by Dow Automotive
TDCC_PU0179266.xls	TDCC_PU0179266	Sales of certain Systems products from 1998-2002 by TDCC North American Systems House business
TDCC_PU0179650.xls	TDCC_PU0179650	Sales of certain Systems products from 2003-2005 by TDCC North American Systems House business
TDCC_PU0180010.xls	TDCC_PU0180010	Sales of certain Systems products sold by the flooring division

File	Bates number	Description
TDCC_PU0180778.xls	TDCC_PU0180778	Certain rebate transactions for Systems products sold by the flooring division
TDCC_PU0180785.xls	TDCC_PU0180785	2000-2005 sales of Systems products
System House 97 Final.xls	TDCC_PU1452189	1997 sales of Systems products
System House 06-08.xls	TDCC_PU1452189	2006-2008 sales of Systems products
TDCC_PU3014535.xls	TDCC_PU3014535	1992-1996 sales of TDI, MDI, Polyols, and Systems
TDCC_PU1420828.xls	TDCC_PU1420828	1997 & 2006-2008 sales of TDI, MDI, and Polyols

## Data processing

The Dow files listed above were appended together. All records in the file “TDCC\_PU0180010.xls” were found in the file “98-05 Poly Request updated.xls” and disregarded. Additional records found to be duplicative across the files were also disregarded.

These data provided ship to customer (“CNSGN\_CUST\_NAME”) and bill to customer name (“LIABL\_CUST\_NAME”) information. Names in both these fields were flagged as direct action plaintiff purchases, class plaintiff purchases, or defendant purchases. The plaintiffs in the direct action group were identified at the direction of counsel (see Appendix C).

The fields called “TRADE\_PROD\_ID”, “TRADE\_PROD\_DESC”, and "MATERIAL\_DESC" were used to identify products in the Dow database. Discovery documents and technical data sheets from Dow's website were used to classify products.

The ship to location fields (“CNSGN\_CUST\_CITY”, “CNSGN\_CUST\_STATE”, and “CNSGN\_CUST\_COUNTRY”) and bill to location fields (“LIABL\_CUST\_CITY”, “LIABL\_CUST\_STATE”, and “LIABL\_CUST\_COUNTRY”) were used to identify the location of these transactions.

The date of each transaction was identified using the invoice date found in the field “POST\_DATE”.

The Dow data contained the net amount field “SumOfGRP\_CRNCY\_AMT”. Freight charges found in the field "Freight" were included in the net purchase amount in the 1992-1996 data.<sup>361</sup> The quantity field (“STOCK\_QNTY”) was standardized to pounds where possible using the unit of measure found in the field “STOCK\_UNIT\_MEAS\_CODE”.

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<sup>361</sup> Freight had to be added to the amount field for the 1992-1996 data to be consistent with the treatment of the 1997-2008 data. In these later period data, freight and adjustment records were indistinguishable, and in the process of combining adjustments with their original transactions, freight records were also combined.

For the 1997-2008 time period, adjustment and freight records were combined with original purchase transactions using unique record identifiers including product, purchaser, and order document number information. There were no record indicators that allowed for the linking of adjustment records to original invoice transactions for the 1992-1996 time period.

## Huntsman

**Figure 71 Original sales and related files received from Huntsman**

File	Bates number	Description
Disc labeled HC013431608	HC013431608	Invoices for Fiscal year 1993
Disc labeled HC013431609	HC013431609	Invoices for Fiscal year 1994
Disc labeled HC013431610	HC013431610	Invoices for Fiscal year 1995
PA - US01 - 200307 - 200312 v3.xls	N/A	07/03-12/03 US sales of TDI, MDI, Polyols, and Systems
PRE - 2002 V3.xls	N/A	01/02-04/02 US sales of TDI, MDI, Polyols, and Systems
PRE - 1999 V3.xls	N/A	01/99-12/99 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200205 - 200212 v3 part II.xls	N/A	05/02-12/02 US sales of TDI, MDI, Polyols, and Systems
PRE - 1998 V3.xls	N/A	01/98-12/98 US sales of TDI, MDI, Polyols, and Systems
PRE - NON-US V3.xls	N/A	01/96-04/02 non-US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200401 - 200406 v3.xls	N/A	01/04-06/04 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200807 - 200812 v3.xls	N/A	07/08-12/08 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200301 - 200306 v3.xls	N/A	01/03-06/03 US sales of TDI, MDI, Polyols, and Systems
PRE - 2000 V3.xls	N/A	01/00-12/00 US sales of TDI, MDI, Polyols, and Systems
PRE - 1996 V3.xls	N/A	01/96-12/96 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200801 - 200806 v3.xls	N/A	01/08-06/08 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200607 - 200612 v3.xls	N/A	07/06-12/06 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200205 - 200212 v3 part I.xls	N/A	05/02-12/02 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200707 - 200712 v3.xls	N/A	07/07-12/07 US sales of TDI, MDI, Polyols, and Systems
PRE - 1997 V3.xls	N/A	01/97-12/97 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200701 - 200706 v3.xls	N/A	01/07-06/07 US sales of TDI, MDI, Polyols, and Systems
PA - OTHER - 200205-200812.xls	N/A	05/02-12/08 non-US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200507 - 200512 v3.xls	N/A	07/05-12/05 US sales of TDI, MDI, Polyols, and Systems
PRE - 2001 V3.xls	N/A	01/01-12/01 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200601 - 200606 v3.xls	N/A	01/06-06/06 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200501 - 200506 v3.xls	HC010941724	01/05-06/05 US sales of TDI, MDI, Polyols, and Systems
PA - US01 - 200407 - 200412 v3.xls	N/A	07/04-12/04 US sales of TDI, MDI, Polyols, and Systems

## Data processing

The invoices provided for fiscal year 1993-1995 had to be extracted using the instructions provided by Huntsman (Bates number HC013431593-HC013431610). Optical Character Recognition (OCR) software was then applied to the invoice files and the data were extracted and

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combined with the electronic transactional data covering 1996 through 2008. No duplicate records were identified in these data.

These data provided ship to customer (“END\_USER\_NAME”) and bill to customer name (“SOLD\_TO\_NAME”) information. Names in both these fields were flagged as direct action plaintiff purchases, class plaintiff purchases, or defendant purchases. The plaintiffs in the direct action group were identified at the direction of counsel (see Appendix C).

The field called “MATERIAL\_NAME” was used to identify products in the Huntsman database. Discovery documents, technical data sheets from Huntsman’s website, and the field called “TAPC\_NAME” were used to classify products.

The ship to location fields (“END\_USER\_CITY”, “END\_USER\_STATE”, and “END\_USER\_COUNTRY”) and bill to location fields (“SOLD\_TO\_CITY”, “SOLD\_TO\_STATE”, and “SOLD\_TO\_COUNTRY”) were used to identify the location of these transactions.

The date of each transaction was identified using the invoice date found in the field “INVOICE\_DATE”. When the invoice date was missing, the date of the transaction was set equal to the first day of the fiscal month and year found in the field “PERIOD”.

The field “NET\_SALES\_VALUE” was used to represent the value associated with each transaction. The quantity field (“VOL\_LBS”) was already expressed in pounds and no further standardization was required.

Adjustment records were combined with original purchase transactions using the fields “SOLD\_TO\_NAME”, “MATERIAL\_NAME”, “SO\_REF” (order number), and “SO\_ITEM” (order line item number).

## Lyondell

**Figure 72 Original sales and related files received from Lyondell**

File	Bates number	Description
LYU00051740.HIGHLY_CONFIDENTIAL.SAP Sales 2002.xls	LYU00051740	01/02-12/02 SAP sales of TDI and Polyols
LYU00051738.HIGHLY_CONFIDENTIAL.SAP Sales 2000.xls	LYU00051738	07/00-12/00 SAP sales of TDI and Polyols
LYU00051737.HIGHLY_CONFIDENTIAL.SAP Sales 2001.xls	LYU00051737	01/01-12/01 SAP sales of TDI and Polyols

File	Bates number	Description
LYU00051749.HIGHLY_CONFIDENTIAL.SAP Sales 2006.xls	LYU00051749	01/06 SAP sales of TDI and Polyols
LYU00056736.HIGHLY_CONFIDENTIAL.SAP Data 2002 to 2005.xls	LYU00056736	01/02-12/06 SAP sales of TDI and Polyols
LYU00051758.HIGHLY_CONFIDENTIAL.Sales Customer_Sold_to_Mast~1.xls	LYU00051758	List of bill to customer addresses for customers in the Legacy data
LYU00051742.SAP Sales Customer Addresses.xls	LYU00051742	List of bill to customer addresses for customers in the SAP data
LYU00051754.HIGHLY_CONFIDENTIAL.Legacy Sales_Inv_1998.xls	LYU00051754	01/98-12/98 Legacy sales of TDI and Polyols
LYU00051757.HIGHLY_CONFIDENTIAL.Legacy Sales_Inv_TDI_1996_2~1.xls	LYU00051757	02/96-06/00 Legacy sales of TDI
LYU00051752.HIGHLY_CONFIDENTIAL.Legacy Sales_Adj_1998_2000.xls	LYU00051752	01/98-05/00 Legacy sales adjustments of TDI and Polyols
LYU00051753.HIGHLY_CONFIDENTIAL.Legacy Sales_Adj_TDI_1996_2~1.xls	LYU00051753	03/97-06/00 Legacy sales adjustments of TDI
LYU00051755.HIGHLY_CONFIDENTIAL.Legacy Sales_Inv_1999.xls	LYU00051755	01/99-12/99 Legacy sales of TDI and Polyols
LYU00051756.HIGHLY_CONFIDENTIAL.Legacy Sales_Inv_2000.xls	LYU00051756	01/00-06/00 Legacy sales of TDI and Polyols
LYU00051747.HIGHLY_CONFIDENTIAL.Legacy Sales_1996_2000.xls	LYU00051747	02/96-12/00 Legacy sales of TDI and Polyols
Sales Invoice Data3.xls	N/A	01/95-12/95 Legacy sales of Polyols
1994 Polyols Sales.pdf	N/A	01/94-12/94 sales volumes of Polyols
LS00001-LS00151 (1996 polyols).xls	Taken from LS00001-LS00151	01/96-12/96 sales volumes of Polyols
LS00167-LS00351 (1997 polyols).xls	Taken from LS00167-LS00351	01/97-12/97 sales volumes of Polyols
Attachment.xls	N/A	List of adjustment numbers and corresponding invoice numbers for adjustments in 2002

## Data processing

Although Lyondell initially provided sales data for 1995 through 2005, the polyols sales data were incomplete for 1996 and 1997 (specifically, the only polyol product contained in the 1996 and 1997 sales data was “**ARCOL FEXPOL**”). Duplicate records were found within and across Lyondell’s files and were disregarded. Lyondell subsequently provided polyol sales volume data for 1994, 1996, and 1997, which were combined with the electronic sales data for 1995-2005.

The 1994, 1996, and 1997 data were obtained in hard copy form and OCR software was used to extract the purchase volumes.<sup>362, 363</sup>

These data provided ship to customer (“ship\_to\_name”) and bill to customer name (“sold\_to\_name”) information. Names in both these fields were flagged as direct action plaintiff purchases, class plaintiff purchases, or defendant purchases. The plaintiffs in the direct action group were identified at the direction of counsel (see Appendix C).

The field called “inv\_dec” was used to identify products in the Lyondell database.

The ship to location fields (“inv\_ship\_ctry” and “ship\_to\_city\_state”) and bill to location fields (“sold\_to\_city”, “sold\_to\_state”, and “sold\_to\_country”) were used to identify the location of these transactions.

The date of each transaction was identified using the invoice date found in the field “invoice\_date”.

The Lyondell data contained the net amount field “taxable\_amount”. The quantity field (“invcd\_qty”) was already expressed in pounds and no further standardization was needed.

Adjustment records were combined with original purchase transactions using the “Attachment.xls” file provided by Lyondell, which provided the original invoice numbers for certain adjustment records in 2002. There were no record indicators that allowed for the linking of adjustment records to original invoice transactions for other time periods.

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<sup>362</sup> No information on sales values was provided for the 1994, 1996, and 1997 data, and the purchase volumes were rounded to the nearest thousand pound.

<sup>363</sup> On April 14, 2011, one day before my report was initially submitted, Lyondell provided sales quantity data in hard copy form for 1996 and 1997. I have reviewed and incorporated this information into this revised report. I estimated purchase amounts and overcharges for Plaintiff purchase volumes by identifying comparable transactions as described in ¶ (288). I did not estimate purchase amounts and overcharges for other purchasers.